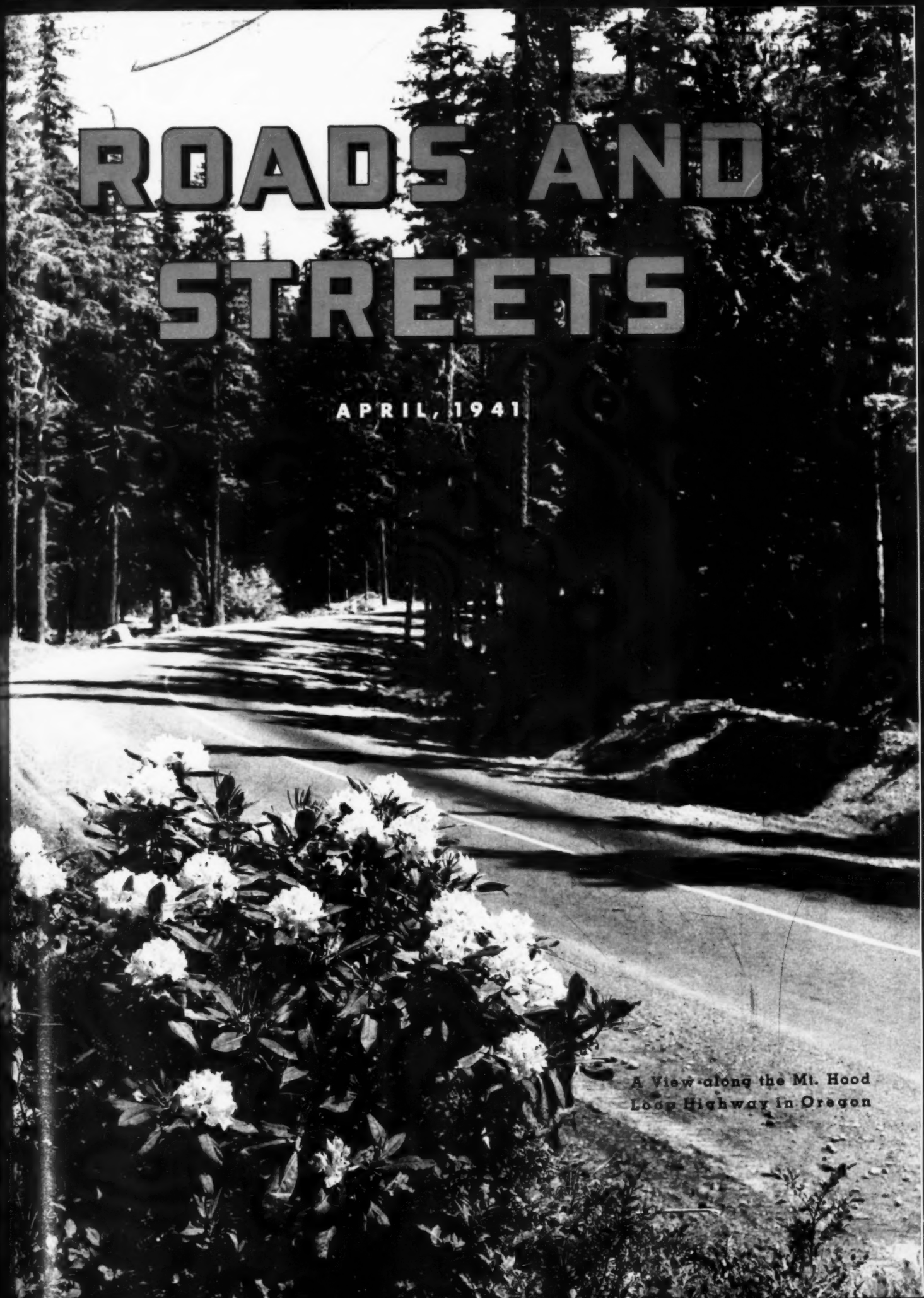
ROADS AND STREETS

APRIL, 1941



A View along the Mt. Hood Loop Highway in Oregon

Top-Notch

ANY WAY YOU FIGURE THEM . . .

THE quick adaptability of Adams Leaning Wheel Graders to every job, their easy operation, and their capacity for hard work, gives them a "top-notch" rating among thousands of users who are familiar with all other makes. Available in 8, 10, and 12-ft. sizes—either hand or power-operated.

Because of their distinctive frame, front axle, and plow beam design, Adams Elevating Graders enjoy the same rating on all types of road and dirt-moving projects. Available in 42-in. and 48-in. carrier sizes, fully power-operated.

Space here does not permit a good start at telling you of all of the work-producing, money-saving features of these machines. If you have need for equipment of this type please let your local Adams representative tell you the complete story or write for catalogs.

Upper illustration shows 12-ft. leaning wheel grader with power-operated controls and pneumatic tires—the deluxe machine of all leaning wheel graders . . . Lower illustration shows elevating grader making cut on road building job. These machines also available with pneumatic tires.

J. D. ADAMS COMPANY • INDIANAPOLIS, IND.

* * *

Motor Graders, Leaning Wheel Graders, Elevating Graders, Hauling Scrapers, Retread Pavers, Road Maintainers, Etc.

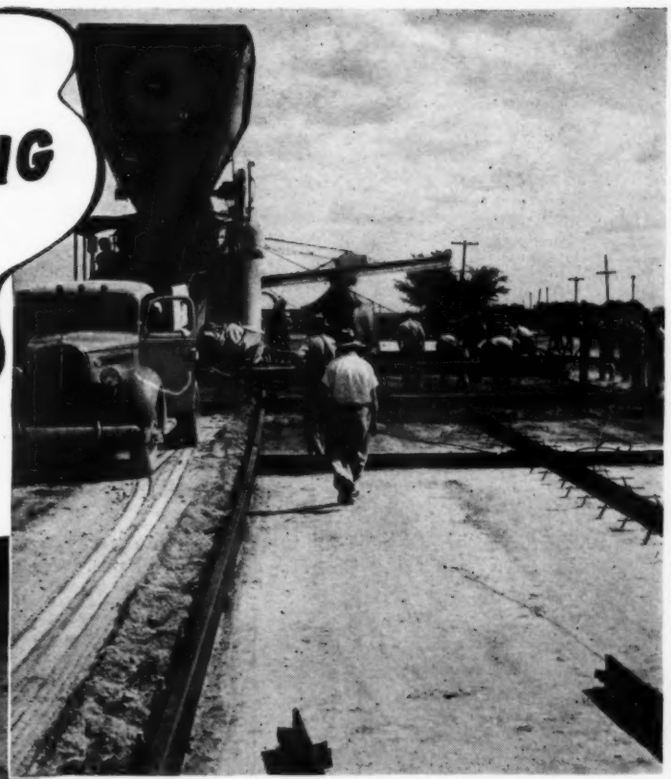
ADAMS LEANING WHEEL GRADERS ELEVATING GRADERS

HOW TO KEEP AMERICA ROLLING

... REDUCE TRAFFIC DELAYS
SAVE TIME AND MONEY
ON ROAD BUILDING
WITH ATLAS HIGH-EARLY CEMENT

FACE-LIFTING A STREET IN A HURRY with Atlas High-Early! This is West Carson Street, Pittsburgh—a streetcar line, and a section of the Lincoln and William Penn Highways. Heavy traffic here, and many days saved. Just 72 hours after the top course of Atlas High Early concrete was laid, normal streetcar service was resumed—with real economies in time and overhead. Contractor: McCrady Construction Co., Pittsburgh.

$3 A CUBIC YARD OF CONCRETE SAVED in construction of this Northern Pacific underpass, Bismarck, N. D. This job was done in winter, and the contractor, the Minneapolis Bridge Co., reported a saving of $3 per cu. yd. of concrete in protection and curing costs—thanks to Atlas High-Early cement! This large saving was partly due to the fact that it was necessary to place the concrete in a number of operations, no one placement exceeding 30 cu. yds.



SPEEDING ON AN ILLINOIS ROAD to connect two important state traffic routes with a new stretch of highway. Expensive maintenance costs for an 1100-foot detour were eliminated many days sooner by using Atlas High-Early cement. Traffic was moving again on the highway with a minimum of delay. Contractor: Powers-Thompson Construction Co., Joliet, Ill. Resident Engineer: Terry P. Smith, Illinois State Highway Department.

THE THREE CASES pictured here are typical of the part Atlas High-Early cement plays in keeping wheels rolling on American highways. This cement lops off time required for protection and curing by as much as 60% to 70%—it generally permits earlier stripping and re-use of forms, which often means big savings—and most important of all, it produces serviceable concrete in much less than the usual time.

Specify Atlas High-Early cement on your next job! And send today for your free copy of "Case Histories of Days and Dollars," which gives the whole story of the speed and economy of Atlas High-Early cement. Universal Atlas Cement Co. (United States Steel Corp. Subsidiary), Chrysler Bldg., N. Y. C. *Sales Offices:* New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

HS-II 3

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

ROADS and STREETS

With which have been merged GOOD ROADS and ENGINEERING & CONTRACTING
ESTABLISHED 1892
Published Monthly by GILLETTE PUBLISHING COMPANY, 330 South Wells Street, Chicago, Illinois

CCA

This Magazine Is Devoted to

Design, Construction, Maintenance and Operation of Highways, Streets, Bridges and Grade Separations; Also Construction and Maintenance of Airports

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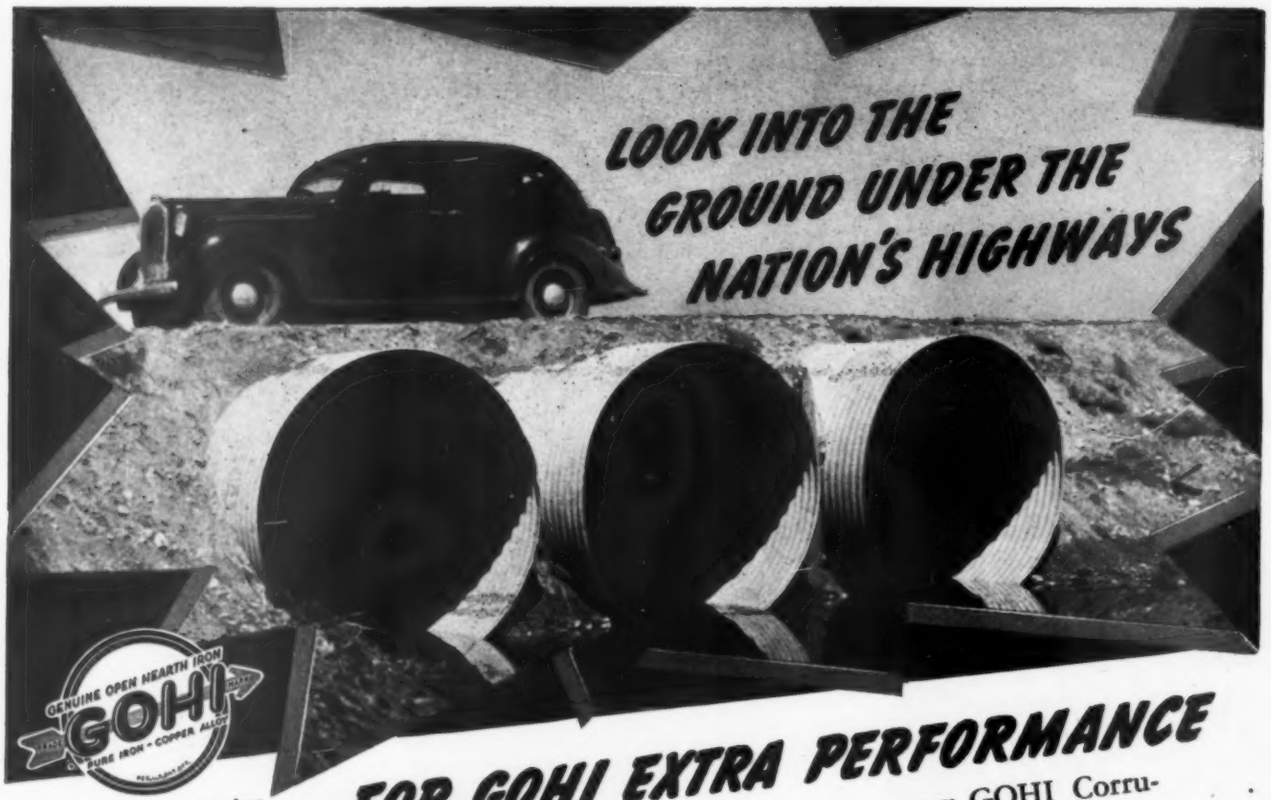
.... If it's a real Rock Shovel you won't have to worry about output in dirt!



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Every day, under all types of roads, meeting every imaginable drainage condition, GOHI Corrugated Pipe safeguards thousands of miles of highways. Strong and durable; withstanding the punishment of heavy, high speed traffic, alternate freezing and thawing, and shifting, heavy fills; resisting the destructive action of corrosion and abrasion, GOHI Corrugated Pipe is writing new records of trouble-free, low-cost-per-year performance. This is because GOHI Pure Iron-Copper Alloy — the finest ferrous culvert metal produced — is used in every GOHI Corrugated Pipe. Ask any of the fabricators listed below for full details.

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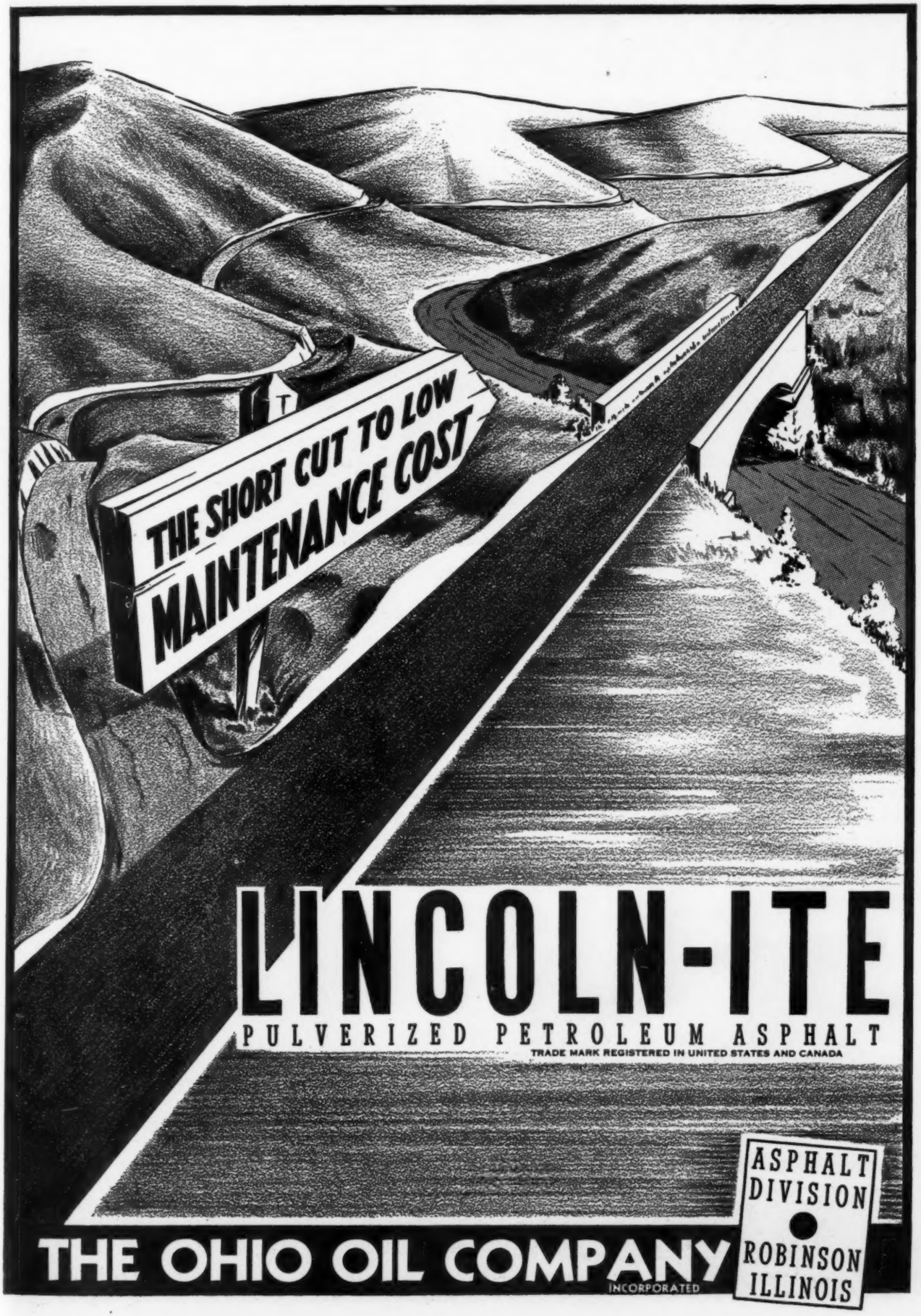
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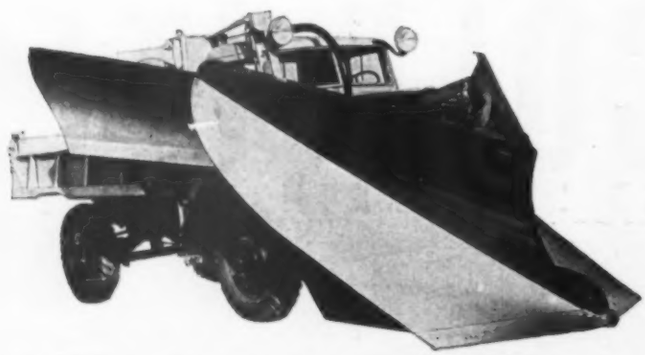
WALTER SNOW FIGHTERS ARE MADE IN THE ONLY PLANT DEVOTED ENTIRELY TO —— *FOUR WHEEL DRIVE* ——

Walter Four-Point Positive Drive with Suspended Double Reduction

It took a quarter-century of specialization on four-wheel drive to produce the hard-hitting Walter Snow Fighter of today. During *all* of that time *all* of the attention of *all* of the personnel of this Company—management, engineering and manufacturing—has been concentrated on the task of producing the best possible type of four-wheel drive. Because of its amazingly superior performance we call it "Four-Point Positive Drive". Walter Snow Fighters are built in a modern plant of ample area to insure uncrowded straight-line production by skilled workmen. Only by uninterrupted manufacture of four-wheel drive units exclusively has it been possible to turn out a vehicle that will stand up under the punishment that the Walter takes as daily fare in the heavy snow regions. Send for literature.



Walter Snow Fighter with Offset V Plow and Right Wing

Walter Tractor Truck with Center Scraper Blade

WALTER MOTOR TRUCK CO.

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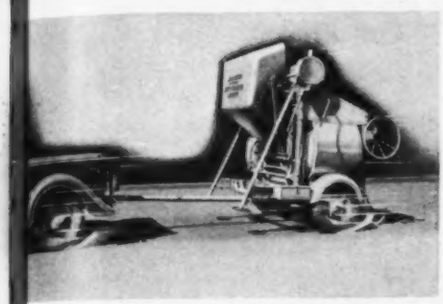
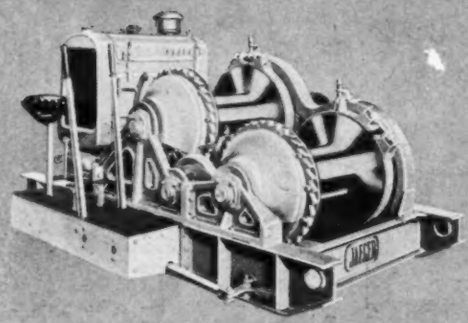
JAEGER Offers 9 Types of High Production Tools for Contractors



1: CONCRETE, MORTAR, PLASTER MIXERS:

Fast End-Discharge SPEED-LINE Trailers up to 14S size with Automotive-Type Transmission, Machined Steel Drum Tracks, Plant Mixers to 56S Size —Tilters, Plaster Mixers, Portable Cold-Mix Plants. Outsell all others on speed, dependability. Ask for catalog, prices.



2: "Touch Control" HOISTS

Most advanced type on market—Giant Expanding Clutches give effortless control. Anti-Friction bearings, balanced drums, 50% stronger. Sizes 6 to 100 H.P., one to three drums, gas, electric, diesel. Get our low price on 17 to 36 H.P. Builders Hoist.

3: PLACING Equipment

Self-Raising Tower cuts placing costs. Full ton capacity, portable on job, heights to 67 ft. Mast plants, towers to 500 ft.

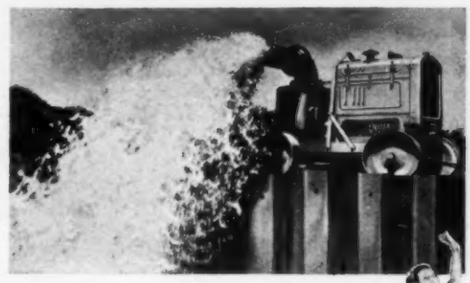
"Easy Dump" Carts

Sizes to 11 cu. ft.—perfectly balanced—extra strong. Ask for catalog. Low prices.

4: TRUCK MIXERS and "AUTO PAVERS"

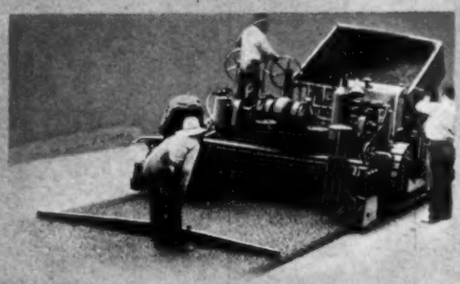
Jaegers far outsell all others because of faster operation, quality of mix and minimum maintenance. Both "LOW CHARGE" and "HIGH DUMP" types of Truck Mixers, Agitators—sizes 2 to 8 cu. yds. Mobility, flexibility cut job costs. New catalog shows you how.

"Auto-Pavers" with spreader—the mobile paving plant.



5: "Sure Prime" PUMPS

Contractors buy more Jaeger Pumps than any other make. Prime automatically up to 5 times faster, pump huge volume, give thousands of hours extra service. Compact, portable. Capacities to 240,000 G.P.H.; gas, electric. Also Jetting Pumps, Road Pumps.



6: BITUMINOUS PAVERS

Adjustable up to 14 ft. widths—capacity over 100 tons an hour on many jobs. Smoother finish insured by long equalizing runners acting as movable forms. Puts no weight or traction on new-laid material. Cuts cost of laying stone, macadam, hot or cold mixes. Ask for catalog.

7: CONCRETE SPREADERS

Twenty-five used on Pennsylvania Turnpike alone—re-mix, spread, strike-off fast as dual-drum pavers or "Auto-Pavers" can produce. Speed production, cut costs, improve slab texture.

8: Type "H" De Luxe FINISHERS

Speed and traction easily match pace of 34E dual drum pavers and concrete spreaders. Single 4-Speed Transmission, new smoothness of finish, completeness of control. 4 ft. telescopic width changes built in. Ask for catalog.

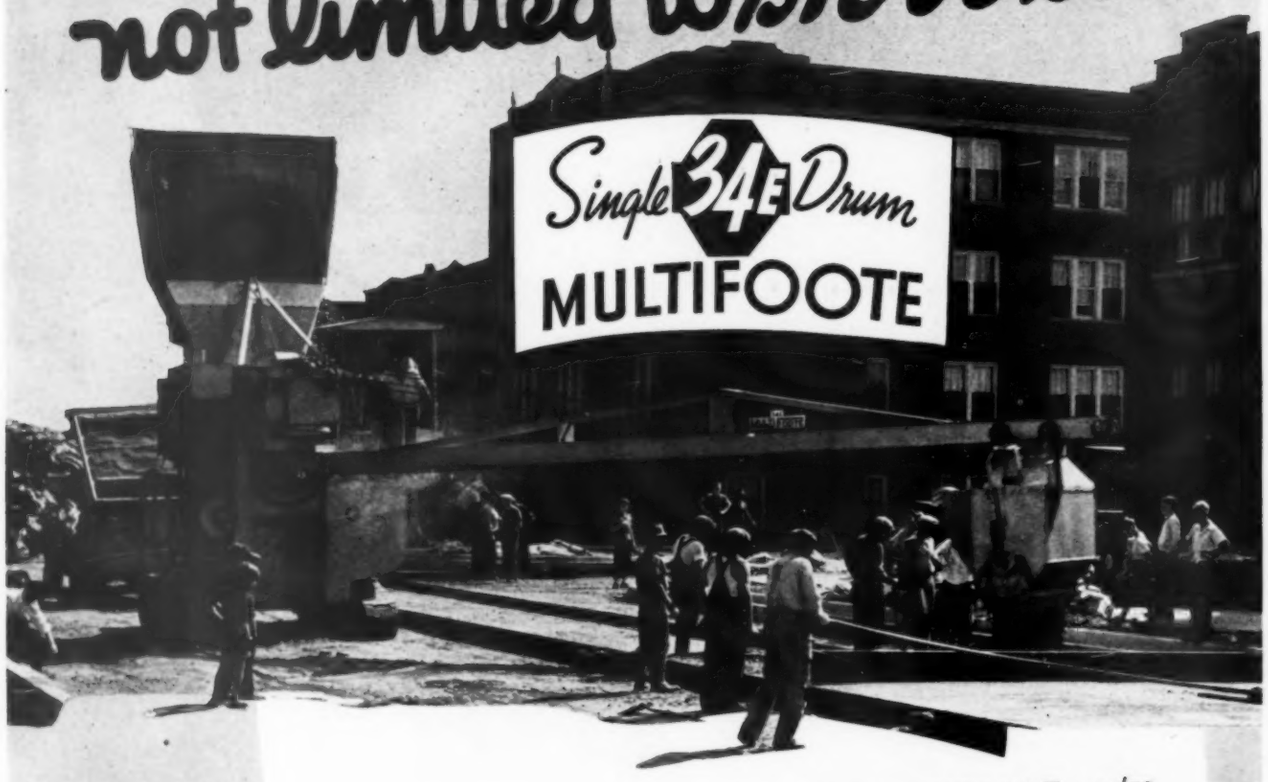
FORM TAMPER: Does 6-to-8 man job of tamping under forms. Widely used.

9: MIX-IN-PLACE ROAD BUILDERS

Traveling pug-mills that mix in one pass. Model MP-2, Self-Propelled, mixes up to 16 cu. ft. windrows, 150-180 tons an hour of heavy mat or stabilized base. Accurately measures bitumen or water. Can be equipped to spread and strike-off. Model MP-1, Tractor Drawn, mixes and smoothly lays over 3 miles of retread a day. Popular price.

THE JAEGER MACHINE CO. 223 DUBLIN AVENUE COLUMBUS • OHIO

Here's a BIG PAVER that's not limited to BIG JOBS!



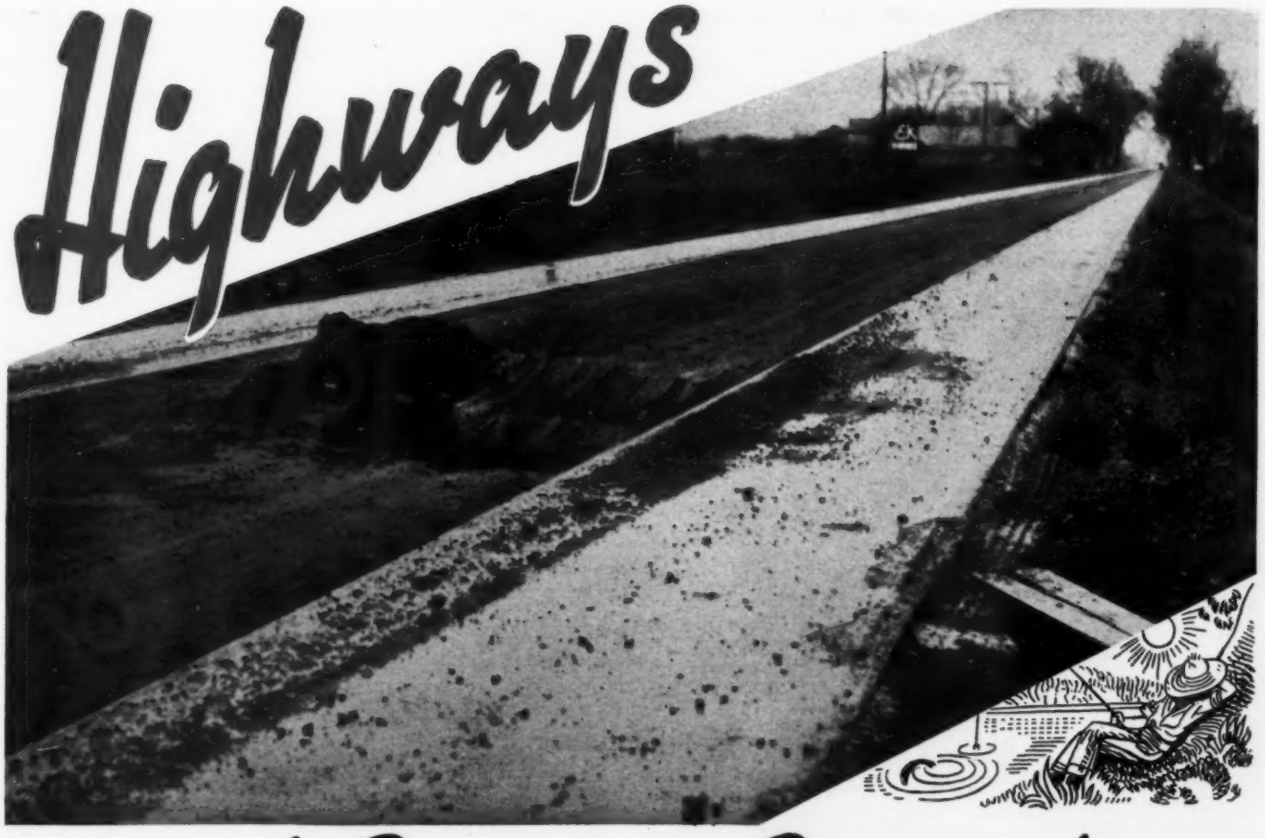
WHEN you buy a MultiFoote SINGLE DRUM 34-E, you're buying an *all-purpose* paver that has big capacity and speed to put down any road at a profit! City street or superhighway, the MultiFoote 34-E pays out. With no more men or equipment than with a 27-E you get 37.4 cubic feet in every batch on level ground and that's really rolling—White Consolidated, Inc., Chicago, put down 402 batches on a city street in 8 hours; E. A. Meyer, Winnetka, Ill. paved 1100 ft. of 9-9-7-9-9 slab in 8 hours in a State Highway in Southern Illinois; other 34-E SINGLE DRUM MultiFoote users report similar results.

The 34-E doesn't represent too big an investment in itself—it doesn't require any extra men or machines to handle its output—it's easy to maneuver and transport—and it has all the proved MultiFoote advantages including double cone drum—high operating platform; fast charging and quarter-turn discharge; fully enclosed travel gears running in oil; simple, easy-to-get-at mechanism; only one main shaft and all high speed shafts mounted on Timken bearings; heavy, long crawlers; accurate water system, oversize axles; rigidly braced frame.

Take the first step to bigger paving profits in '41—write for Catalog today!

THE FOOTE COMPANY, INC.
Nunda, New York

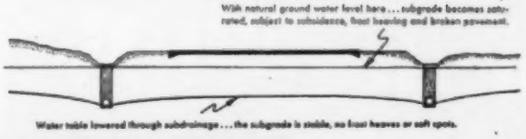
Highways



...get Spring Fever too!

High Maintenance Costs Would Have Been Eliminated By The Installation Of An Efficient Subdrainage System

With natural ground water level here . . . subgrade becomes saturated, subject to subsidence, frost heaving and broken pavement.



Water table lowered through subdrainage . . . the subgrade is stable, no frost heaves or soft spots.

The diagnosis of nearly all cases of "Highway Spring Fever" will show that they are caused by the presence of excessive ground water.

"An ounce of prevention—" is good advice here as it is elsewhere. In highway construction, the removal of harmful ground water through a subdrainage system, will stabilize the foundation and prevent trouble such as is apparent in the picture above.

Toncan Pipe is ideally suited for subdrainage work. It develops many times the strength required . . . maintains proper alignment . . . and is perforated for maximum infiltration with minimum silting.

Toncan Perforated Pipe is available in diameters from 6" to 30" and in lengths up to 24 feet.

Specify Toncan Subdrainage Pipe and free the highway of its "Spring Fever" attacks. Toncan Culvert Manufacturers Association, Republic Building, Cleveland, Ohio.

Call the Toncan Man

TONCAN IRON

PRODUCT OF REPUBLIC STEEL

C57

If you need a 1-yard excavator with real guts from dipper teeth to cats, ask for the full story on the 29-B.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

Baby Young Concrete

AND YOU WILL GIVE IT THE NECESSARY STRENGTH FOR LONG LIFE . . .

Specify

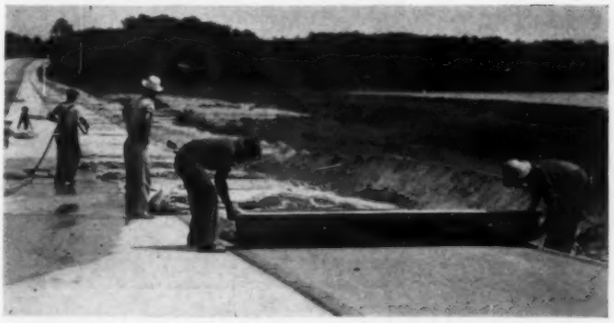
NATIONAL BRAND

Cotton Quilts for curing and protecting fresh concrete

AUTHORITIES agree freshly laid concrete needs more than an ordinary curing agent to protect especially the upper inch of the slab. The Portland Cement Association and Public Roads Administration found that *COTTON QUILTS* protect the concrete slab against severe temperature stresses so important to young concrete.

Thirty-three of the 48 individual State Highway Departments already specify Cotton Quilts for curing. All 48 specify one or more water methods. No new fangled curing agent has been found to substitute an efficient WATER METHOD. Among the various water methods COTTON QUILTS are the simplest, most efficient and economical as shown by exhaustive field tests made by the Texas State Highway Department where *ALL COTTON QUILTS* have with reasonable care withstood from 100 to 150 applications and removals on fresh concrete.

CALL FOR 100% AMERICAN COTTON MADE IN U·S·A



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are finding that NATIONAL QUILTS are **fast-selling.** They will be increasingly so in 1941, owing to extra activity in the road building industry due to national defense requirements, and to the hearty endorsement given COTTON QUILTS by Federal and State authorities.

Open territory now available. **Distributors' inquiries invited.**

"USE MORE COTTON"
for Better CONCRETE-CURING"

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AN INVESTMENT IN WIRE FABRIC *Pays!*

U·S·S Wire Fabric adds the extra protection of a "back-bone of steel" to concrete highways. It is inexpensive and easy to install, and in the long run this added protection more than pays for itself.

Wires of steel interlaced in concrete reinforce the slab in every direction. The strength of the steel reduces the danger of cracking, spalling and heaving, and should tiny cracks appear, U·S·S Wire Fabric retards their spreading and puts off the day when repairs will be necessary.

U·S·S Wire Fabric is made of high-yield-point cold-drawn steel. The wires are closely spaced to provide uniform stress distribution. This product is available for quick delivery in either sheets or rolls—in Electric Welded Rectangular or Square Mesh and in Triangle Mesh.

USS

WIRE FABRIC

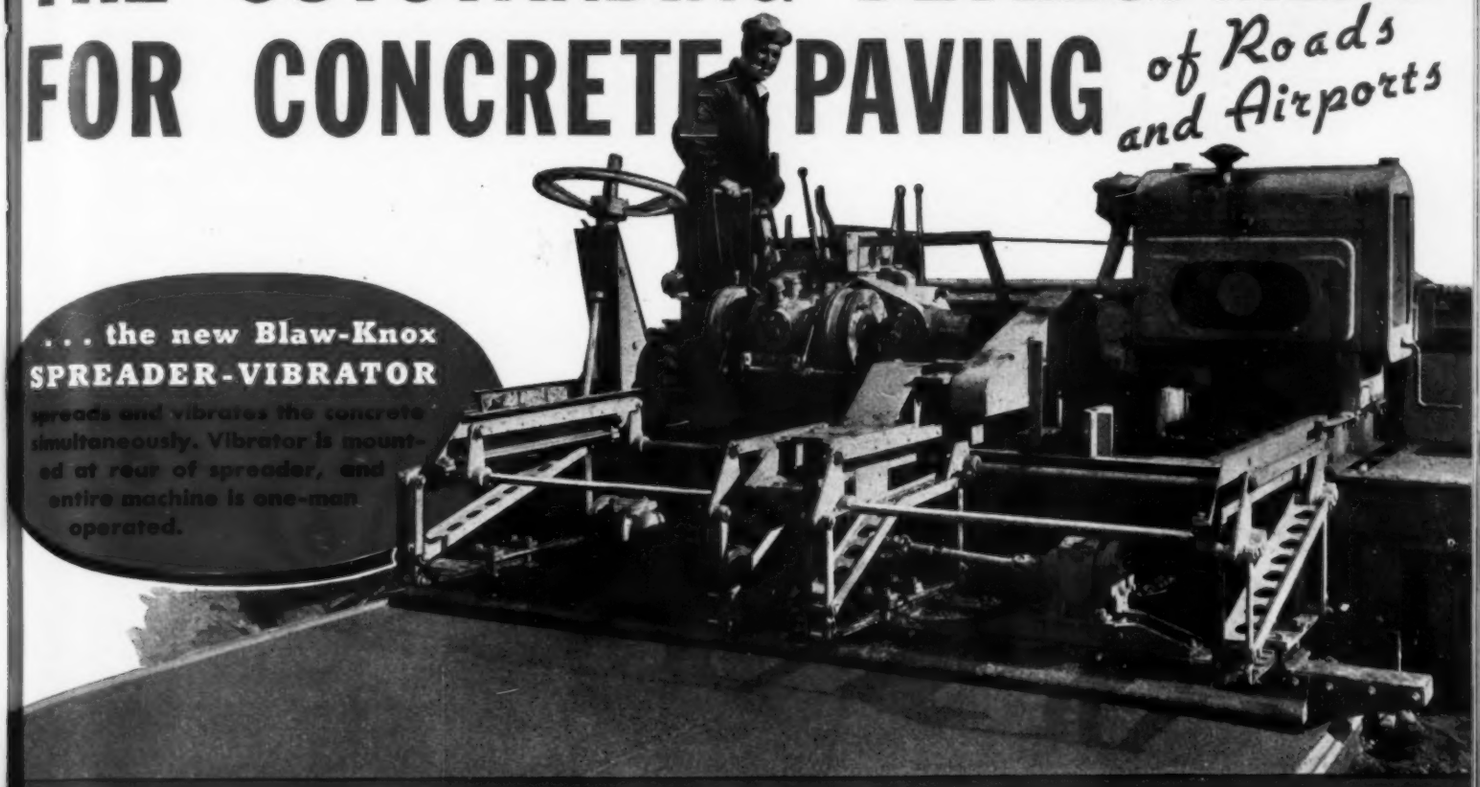
AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

THE OUTSTANDING DEVELOPMENT FOR CONCRETE PAVING *of Roads and Airports*



. . . the new Blaw-Knox SPREADER-VIBRATOR spreads and vibrates the concrete simultaneously. Vibrator is mounted at rear of spreader, and entire machine is one-man operated.

BLAW-KNOX CONCRETE SPREADERS VIBRATORS ROAD FINISHERS

Introduction of the Blaw-Knox SPREADER-VIBRATOR marks a new trend in road paving methods—now, concrete of ½-inch and ¾-inch slump can be quickly and successfully compacted, surfaced and finished.

This new equipment, which provides an entirely new method for high speed, quality concrete paving construction, has aroused decided interest among highway engineers and contractors throughout the country. It's the most outstanding development in recent years for the paving industry.

Mechanized Blaw-Knox equipment will build roads faster, cheaper and better. Get full information about Blaw-Knox Transverse Blade CONCRETE SPREADERS; SPREADER-VIBRATORS; Model "X" FINISHING MACHINES and VIBRATORY FINISHERS for wide or narrow roads.

BLAW-KNOX DIVISION of Blaw-Knox Company
2003 FARMERS BANK BUILDING PITTSBURGH, PA.
NEW YORK CHICAGO PHILADELPHIA BIRMINGHAM
Representatives in Principal Cities

BLAW-KNOX CONSTRUCTION EQUIPMENT includes:
Batchers • Road Forms • Street Forms • Concrete Spreaders
Tamping Rollers • Vibrators • Concrete Buckets
Clam-Shell Buckets • Truck Mixers • Striping Machines • Turntables
Road Finishers • Steel Forms

The Blaw-Knox Transverse Blade CONCRETE SPREADER automatically spreads the concrete dumped by the paver. It spreads for laying mesh, and then spreads the top course to finished grade. Vibrator attachment available.

The Blaw-Knox Model "X" ROAD FINISHER is designed for high speed production and quality finish. For both wide and narrow roads. Maximum 4-ft. width adjustability when specified. Vibratory attachment available.

OWENS 'Dig In' FOR DEFENSE

The OWEN BUCKET Co.
4070 BREAKWATER AVE. CLEVELAND, OHIO
BRANCHES: New York, Philadelphia. Chicago, Berkeley, Cal.

Dig, Haul and Dump
AT LOWEST COST

Sauerman Slackline Cableway Bucket

Sauerman Crescent Scraper Bucket

Sauerman Cableway digs, hauls and lifts sand at cost of 4c per cubic yard.

Sauerman Slackline Cableways, Scrapers and Tower Excavators offer the most satisfactory solutions for material-handling work requiring machinery that will dig, convey and automatically dump.

These machines will dig any material that a plough can penetrate. One man controls the entire operation. Power cost and maintenance are exceedingly low per cubic yard of material handled.

A Sauerman machine digs with equal facility under water, on mushy ground, on a hillside or in a rough pit. Operation is continuous — digging, hauling and dumping. Capacities run from 10 to 600 cu. yd. per hour, varying in accordance with size of bucket and length of haul.

Thirty years of successful service prove Sauerman machines the best for long range work.

Write for Catalog.

SAUERMAN BROS., Inc.
488 S. Clinton St. Chicago

SAUERMAN LONG RANGE MACHINES

the hotel preferred

hotel metropole

a stopping place modern in every detail, yet maintaining a friendly atmosphere and hearty hospitality • preferred by experienced travelers • dining room • garage adjacent • rooms from $1.50 • with bath from $2.50

cincinnati, ohio

A ROCKING BEAM Trailer?

YES HERE IT IS!

ROGERS also builds trailers for unusual needs, embodying characteristic features of fundamental design but modified to meet the special requirements. For example, consider the above illustrated

ROGERS TRAILER

This is the new Model T trailer which has two rocking, box-girder sections at each end of which is a spindle, carrying a wheel and two extra large tires. This design gives the desired oscillation and permits building trailers only 8 feet wide in capacities up to 35 tons. This two axle trailer meets the needs existing in some states that limit the tonnage that can be carried on one axle.

Write for information on standard or special trailers which have been tested in difficult service.

ROGERS HEAVY DUTY Gooseneck Trailers

EXPERIENCE . . . . . *builds 'em*
PERFORMANCE . . . . . *sells 'em*

ROGERS BROS. CORP.
110 ORCHARD ST. ALBION, PA.

Speeding back and forth between Chicago and Peoria—644 miles a day on a mile-a-minute schedule—

Rock Island Rocket #601 now *travels 150,000 miles between piston inspections.* Before using RPM DELO it was necessary to pull, inspect and clean pistons in the Rocket's 16-cylinder Electro Motive Diesel *at one-third this distance*—every 50,000 miles!

Cylinder wear has hit a record low of .0005" in 160,000 miles!

Piston rings now operate 180,000 miles between replacements—the best ring mileage Rock Island has ever had.

And valves last longer, too! RPM DELO has kept them working perfectly for over 400,000 miles.

Because it keeps *engines so clean* and lowers wear rate of all engine parts so much—RPM DELO has been chosen by Rock Island for 6 Rockets and most of its Caterpillar, Hamilton and Cummins Diesels used in passenger and switching service.

Aren't these reasons enough for trying it in your Diesel equipment? Do it now!

ORDER RPM DELO
Unequaled
FOR YOUR DIESELS

Approved by the makers of over 95% of the installed Diesel horsepower in America, RPM DELO is marketed under the following names:

RPM DELO
Diol RPM DELO
Kyso RPM DELO
Sohio RPM DELO
Signal RPM DELO
Imperial RPM DELO

Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your locality.

RPM DELO
REG. TRADE-MARK
DIESEL ENGINE LUBRICATING OIL

STANDARD OIL COMPANY OF CALIFORNIA

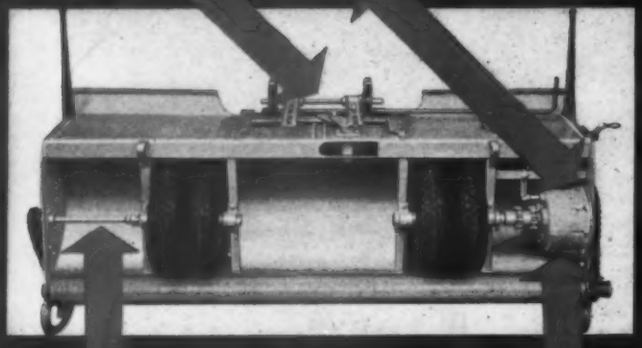
Only the BUCKEYE gives you all these advantages

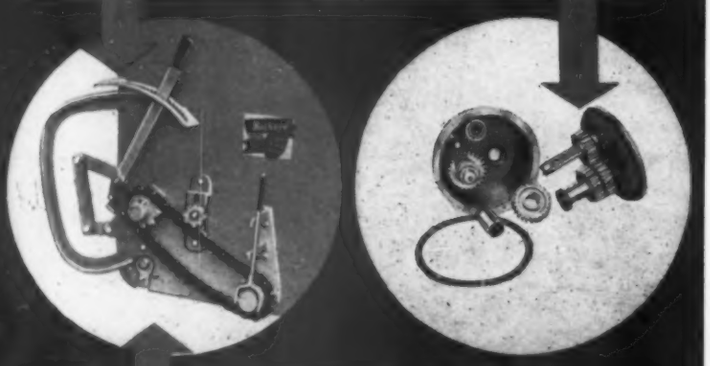
FEED MECHANISMS

Right — Closeup of spirally fluted feed roll. Hinged gate above roll adjusts thickness of spread. Gate automatically stops *all* flow when Spreader stops.

BOTTOM VIEW

Left—Showing under construction of Buckeye Spreader. Spirally fluted feed roll across entire width of box actually grips the material and discharges it positively and evenly at all times. It is chain and sprocket driven from the transmission at a speed bearing a constant relationship to the truck speed. This speed ratio can be varied to give best results for different materials by means of different size sprockets. Spreading is uniform regardless of truck speed. Hand crank provides easy, one-man control of adjustable truck hitch in center of back panel. *(See Upper Left Arrow.)* Hand lever for disengaging hitch shown to right of hitch. Fully enclosed transmission is shown at right of wheels—this provides direct drive from wheels to feed roll. Chain drive at left operates distributor. Skids or guards upon which spreader may be tipped can be seen at ends.



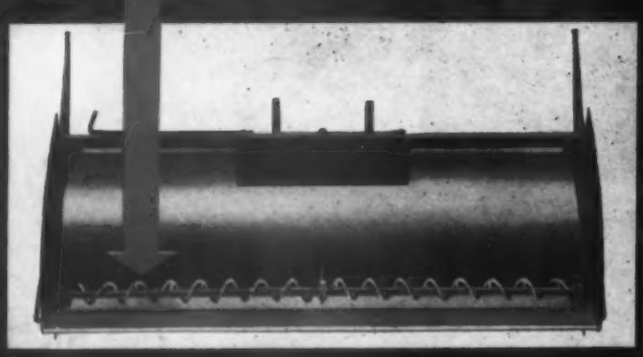


SCREW DISTRIBUTOR

Left Circle—Wet sand and similar materials are kept moving properly by a reversible spiral distributor, easily inserted or removed from the spreader box. It carries material out to the ends of the box and assures an even distribution over the entire width of spread. Drive is from the wheel shaft, quickly disengaged by a simple throw-out. Arrows trace distributor drive and controls and position of distributor.

TRANSMISSION

Right Circle—The transmission runs in a dust and oil tight casing—it is precision-built for long trouble-free service. It is easily and instantly controlled by a hand lever and may be set in a neutral position to stop feeding action of the spread. Transmission is reversing to permit proper rotation of feed roll whether truck is moving forward or backward. Arrows trace transmission drive, controls and position of transmission.



TOP VIEW

Left—Looking down into Buckeye Spreader. Note arched hopper bottom. This directs material to the feed roll; provides a pocket for material at forward edge of spreader to provide counterbalance; and permits placing wheels well in from the ends of the machine to keep them off shoulders and to allow spreading close to roadside obstructions. Screw distributor is shown in pocket over feed roll.

SPREADER

THE Buckeye Spreader construction features described on these pages will make money for you. They make possible an accuracy and uniformity of spread that saves time, labor and material; eliminates patching, brooming and raking; saves truck time and expense; and produces a better, longer-lasting road surface.

Buckeye Spreader owners report accuracy as high as 99%; savings in material of as much as 50%; labor savings of 20% and more; dollar savings of $32 per mile, $1000 per job, $50 per day and similar figures.

There's a Buckeye Spreader for every job — 9, 10, 11, 12 foot widths standard and 13 ft. on special order. Plan now to buy one or more Buckeye Spreaders for bigger profits this year. Write to Buckeye for 8 page Spreader Bulletin today.

BUCKEYE TRACTION DITCHER COMPANY, *Findlay, Ohio*

See other cost cutting Buckeye equipment on Page 61

Above—Spreading over oil base—truck operating in reverse. Note even distribution of material.

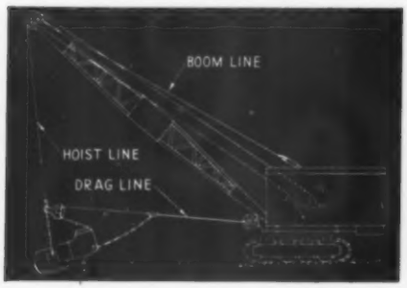
STRIKE-OFF ATTACHMENT
Permits spreading base coarses from 2 to 6 inches deep. Blade mounted on skids is easily adjustable by hand cranks. Feed roll is removed from spreader.

Built by Buckeye

Some TIPS on choosing EXCAVATING ROPE

If the utmost in service is to be obtained from excavating rope, its construction and type of center must be properly matched to the requirements of the job. The following suggestions, while not applicable to all conditions, will serve as a general guide in selecting excavating ropes:

TYPICAL DRAGLINE EXCAVATOR

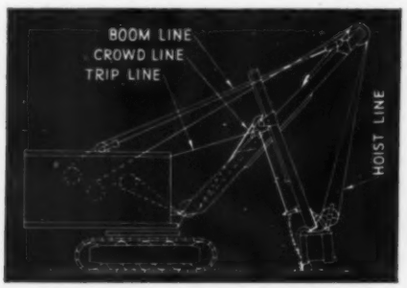


DRAG LINES are subjected more to wear than to bending fatigue. Therefore, the larger outer wires of a Bethlehem 6 x 19 Type U dragline are usually preferred. Lang Lay construction, Purple-Strand quality and IWRC are essential for this service.

HOIST LINES always travel over sheaves and are therefore affected by bending fatigue and crushing. Purple-Strand, Form-Set, 6 x 19 Type W, IWRC is recommended. Lang Lay is usually best.

BOOM LINES are more or less stationary. Ample strength is the main consideration. A Purple-Strand, 6 x 19 Type W rope, regular lay, IWRC or hemp center, is standard.

TYPICAL POWER SHOVEL



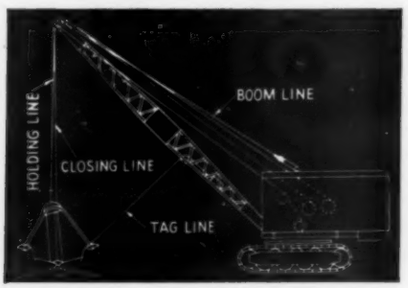
HOIST LINES must stand up under severe bending. They encounter some wear and are subjected to severe shock loads. Typical selection is a Purple-Strand, Form-Set 6 x 19 Type W rope, Lang Lay and with an IWRC.

BOOM LINES—See under Dragline Excavators.

CROWD LINES encounter bending, shock loads and wear. Purple-Strand, Form-Set, 6 x 19 Type W, Lang Lay and IWRC is often used. Some shovels require 6 x 37 flexibility.

TRIP OR DUMP LINES—8 x 19 Plow Steel, hemp core, regular lay, is satisfactory on small shovels; 6 x 19 Type W is preferable on large ones.

TYPICAL CLAMSHELL CRANE



HOISTING LINE—6 x 19 Type W Purple-Strand rope, regular lay, hemp core, is usually recommended.

HOLDING AND CLOSING LINES often encounter severe bending and severe crushing. The 6 x 19 Type W construction is usually used. IWRC is generally required. Invariably the rope is regular lay, Purple-Strand. Usually it is Form-Set.

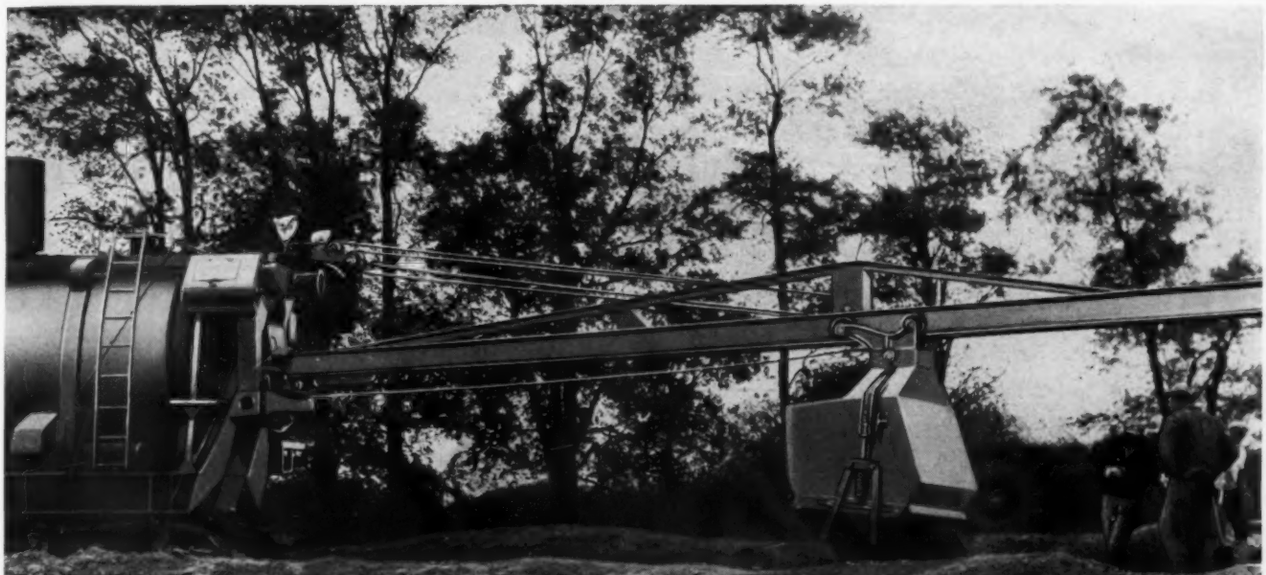
BOOM LINES—See under Dragline Excavators.

TAG LINES—Generally 8 x 19 Plow Steel, regular lay, hemp center lines are used.

Bethlehem produces a full line of ropes for all types of excavating. These ropes are quality built, through and through. Their performance on your job will convince you of their economy and full dependability.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



Two Door Distributing Bucket

SAVES SECONDS ON THE GRADE

Koehring Two Door distributing bucket . . . doors open same direction across full width of bottom . . . Harsh or dry concrete dumped instantaneously.

● Two doors, *opening in the same direction,* dump and spread dry or harsh concrete fast and clean . . . *full width* of bucket bottom is used for dumping . . . you get instantaneous dumping and spreading of concrete with the 34-E Koehring *Twinbatch* Paver. You will save seconds on the grade with every batch . . . and this is important, to meet specified high production schedules . . . when every second counts. Koehring Pavers with Autocycle operation save seconds from skip to bucket . . . cut production costs . . . increase your profit.

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KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Help yourself to a BIG YEAR

Move dirt the cheap way—with modern, powerful, smoother-running 2-cycle Diesel tractors pulling and pushing big capacity Gar Wood Scrapers.

Handle more heavy grading and construction hourly, at less cost, with the more flexible Leaning Frame Grader and with the extra-earth moving capacity of the NEW Model A-D Motor Grader.

Finish up mean jobs in a hurry and at a profit with this Model WM tractor and Hough Shovel. You'll find dozens of uses for this outfit!

Smooth out hauling roads... keep finished work in shape with this low cost W-Speed Patrol. Ideal for light grading and maintenance!

Get Them While They're Hot! Don't Let Old Equipment Hold You Back . . . Modernize Now With A-C Cost-Cutting Pacemakers!

The Construction job ahead almost staggers the senses. Too big to visualize—we only know there's plenty of work to be done . . . and to be done now. Already . . . first eight weeks of 1941 public construction awards top corresponding 1940 period by 123%.* If you aren't getting your share, check up on your equipment. Now is no time to drift! Let your Allis-Chalmers dealer streamline your outfit. He has today's tools . . . to handle today's work—a modern, complete line to fill any dirt-moving need. See him . . . NOW.

* Engineering News-Record Weekly Report—2-20-41

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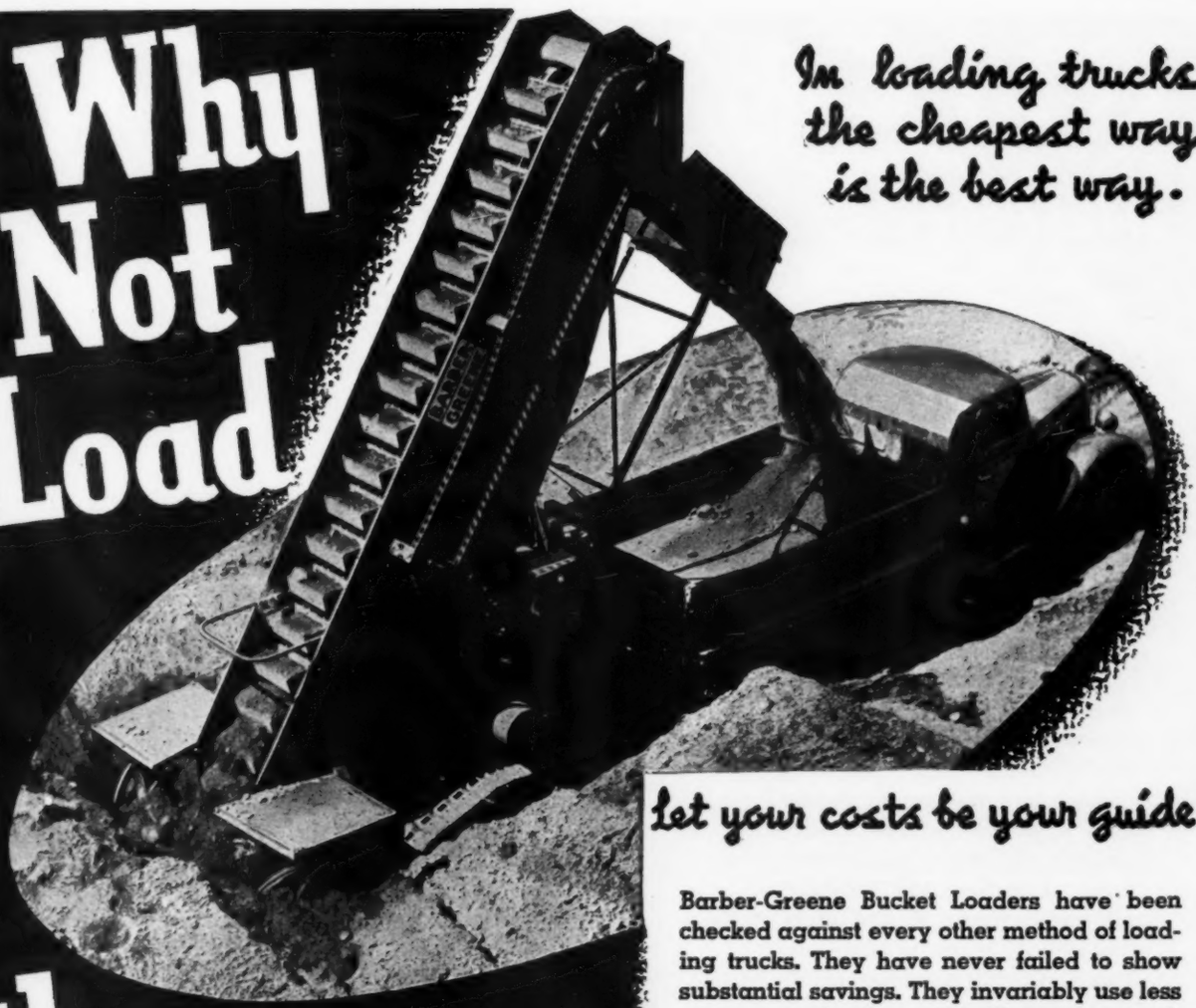
TRACTOR DIVISION—MILWAUKEE, U.S.A.

TRACTORS, ENGINES, ROAD MACHINERY

IT DOESN'T COST .. *it Pays!*

Why Not Load the Cheapest Way?

In loading trucks the cheapest way is the best way.



let your costs be your guide!

Barber-Greene Bucket Loaders have been checked against every other method of loading trucks. They have never failed to show substantial savings. They invariably use less power, require less skill. They save truck time, man time, job time. Their versatility makes them useful the year 'round for all types of loading, stripping, light excavating, and unloading cars. They are available with gravity, shaker or high capacity vibrating screens.

The mechanical design and exclusive features of the Barber-Greene place it way ahead in quality, dependability, and ease of operation.

Write now for full information. There is no obligation.

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MICHIGAN mobile CRANES

Speed Construction!

Setting costly marble on a new office building might not be a defense project. *But*, the mobile, rubber mounted crane that's able to do this precision job at high speed makes light work of countless construction operations calling for action, and plenty of it! Positive, smooth MICHIGAN Air Controls (proven by ten years successful use) permit operators to work swiftly and safely, within fractions of inches. MICHIGAN'S advanced frame design gives low gravity center to entire machine, providing utmost stability for fast, efficient crane work. Ten large pneumatic tires distribute weight evenly, lowering unit ground pressures. The MICHIGAN CRANE gets around with truck mobility—to and from the job in a hurry, handling work of more than one ordinary machine. Heavy duty motors provide ample power for heavy lifts . . . MICHIGAN Tandem-Drive Mobile CRANES, fully convertible to all standard attachments, may be the *profitable* answer to your problem of meeting today's exacting schedules—Bulletin RS14 shows how modern MICHIGAN'S *speed construction* on many fronts—write for it TODAY!

★ ★ ★

MICHIGAN *America's Mobile Shovel-Crane Specialists*

MICHIGAN POWER SHOVEL CO.

BENTON HARBOR MICHIGAN

Smooth riding comfort . . . combined with the longest life and lowest upkeep of any widely used pavement.

Always the least costly...now the best riding

A swift succession of important advances in brick pavement construction have followed each other throughout the past few years.

Result: Modern brick pavements are unexcelled in riding qualities.

There have been advances in technique such as surface filler removal and rolling on boards. There have been basic structural improvements such as the mastic cushion and manufacturing progress such as wire-cut vertical fibre wearing surfaces and de-airing.

Hence, modern brick is a streamlined version of the pavement type that has longest life and lowest maintenance.

This progress comes at a time when it is most useful. For now it is known that brick has by far the greatest resistance to weather damage—starting point of most pavement failures.

Today, modern brick is the perfect surface for any vehicles at any speed plus the lowest cost per year of service. Use it wherever a first-class pavement is called for. National Paving Brick Association, National Press Building, Washington, D. C.

Entrance to Queens-Midtown Tunnel—New York City

VITRIFIED **BRICK**
THE MOST SATISFACTORY PAVEMENT

America

WHEN America decided to dig in, her first demand was for cantonments, enlarged factory capacities, airports and air and naval repair bases. Without these fundamental things she could not train her men, build their weapons or carry on her preparation for defense.

• • •

A dirt-moving job, this all-important preliminary work for the defense of this country. An emergency call for rock-busting, volume-boosting, dirt-moving power and for men to wield that power against time and weather!

"Caterpillar" Diesel power in tractors, engines and road machinery, which was already at work building those things worth fighting for, was ready to create the means with which they could be protected. And while most of the nation groans under an overload, these machines and the men that own them are pitching in on basic defense projects without breaking their stride.

The yardage being moved in this country today would be looked upon as a miracle in any other country in the world. America is really digging in . . . and digging with the tools which have made her famous and which will assure her continued security.

The extension of the defense program places heavy demands on the men in the dirt-moving industry and on the manufacturers who furnish them with the tools for this necessary work . . . big things have been done, and even bigger things have yet to be done.

CATERPILLAR TRACTOR CO., PEORIA, ILL.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

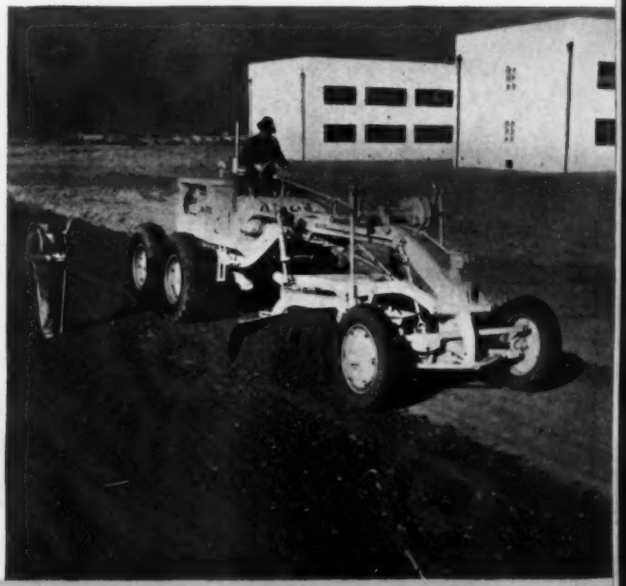
DIGS IN

(AT LEFT) • *Whipping winter's worst conditions to expand the Glenn L. Martin Co.'s plane plant.*

(ABOVE) • *The jack-hammers powder rock as "Caterpillar" Diesel Engines drive compressors.*

(LOWER LEFT) • *Huge scraper-units hasten the building of California's Camp Callan.*

(LOWER RIGHT) • *An air station will have fast roads, smooth runways, because of this machine.*



Yes, it made the grade with flying colors!

MARMON-HERRINGTON

All-Wheel-Drives

—"DO THINGS" NO OTHER TRUCKS OR PASSENGER CARS CAN DO!

Do you need a light truck or passenger car with the agility of a mountain goat? A *heavier* truck with ability to operate with speed and economy "across country" as well as on good roads? A real Mammoth of a truck for transporting big loads over the worst possible going?

Marmon-Herrington builds them all. Converted Ford passenger cars, and light delivery trucks with traction and power applied to the front, as well as the rear wheels. Largest sizes of Ford trucks in either four-wheel-drive or six-wheel-drive models. Enormous, powerful Marmon-Herringtons, capable of carrying 35 ton loads "on their backs," or of pulling a hundred tons or more on trailers.

Each of these vehicles incorporates features of design and construction *found in no other multiple drive vehicles.*

Each has advantages *over all other automotive vehicles* which you should know about. Write for literature. Cable address, MARTON.

MARMON-HERRINGTON CO., INC. • INDIANAPOLIS, INDIANA, U. S. A.

• Any way you look at it, that's a lot of evidence! And it's piling up on all sides. Users by the hundreds are discovering the extra advantages in P&H's tougher rolled steel construction.

Other excavator builders are recognizing it, too. Ultimately, we predict, the entire industry will turn to this more practical and modern design. But why wait until then?

General Offices: 4496 West National Avenue, Milwaukee, Wisconsin

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OF THE TOUGHEST EXCAVATORS EVER BUILT—THAT'S P&H ROLLED STEEL DESIGN

S-M-O-O-T-H as steam — P&H's new hydraulic control. Try it!

FOUR OF FOURTEEN . .

Winners wherever they go, these fast, maneuverable, DR8 Drill Rigs are doing their part in the battle against time to build training camps, air ports and flying fields for America's greatest peace-time army. The Government and private contractors make no mistake when they specify Cleveland DR8's for this important work. Cleveland drill rigs are quick to set up, fast in the actual drilling operation, and are speedily moved from hole to hole. Reports of 1000 to 1500 feet of hole per day are common occurrences with the Cleveland DR8.

The DR8 drills at any angle . . . Automatic air feed is readily controlled for the right feeding speed and bit pressure . . . Recoil device saves the blows which would otherwise be lost due to rebound of the steel . . . Centralizer is effective and easy to operate . . . Frame is used as an air reservoir—acts as a pulsation compensator . . . Actual feed is over 8 feet, for 6-foot steel change . . . DR8 does its work with fewer bits than any other wagon drill . . . Let us send Bulletin 311—it tells you many other advantages of the Cleveland DR8.

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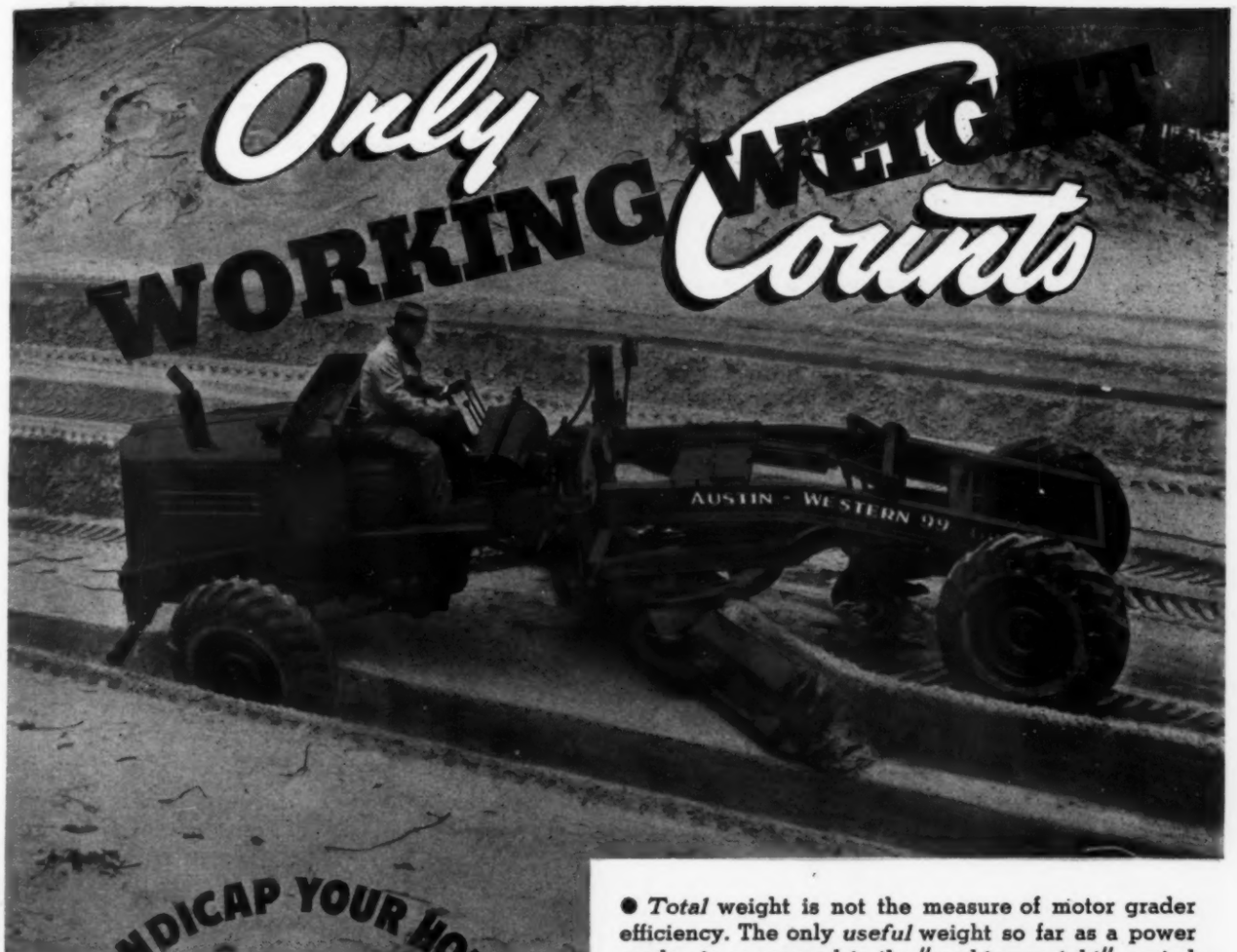

A motor grader without power on the front wheels is like a draft horse with roller skates on his front feet.

● *Total* weight is not the measure of motor grader efficiency. The only *useful* weight so far as a power grader is concerned is the "working weight" carried on a DRIVING WHEEL.

Figured in terms of live tractive weight, the A-W "99" is the HEAVIEST motor grader on the market Every pound rests on a DRIVING WHEEL . . . contributes 100% to traction. There are no idling front wheels — carrying *dead* weight to waste power and decrease operating efficiency.

That's why the A-W "99" — with every pound of weight on a drive wheel — (1) will move more material, faster and farther; (2) work in rough ground where other motor graders cannot work at all; (3) *work* in sand and other soft and wet materials where other motor graders cannot even go through with the blade empty; (4) eliminate wastes of engine power required to push around front-end weight which serves no useful purpose.

Before you specify or buy any motor grader see for yourself what the 100% Working Weight of a "99" Power Grader means in terms of year 'round performance, power saving, and extra range of usefulness. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.

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Austin-Western

NATIONAL DEFENSE speed-up is putting peak loads and overloads on all types of industrial equipment. *Safe* maintenance of top performance depends on *correct* lubrication. For *earth moving* and *road construction machinery* there are . . .

. . . SINCLAIR OILS and **GREASES** specially developed for *safe* peak load operation of all types of equipment. Sinclair's complete line of lubricants and fuels promote sustained delivery of full machine output under toughest service conditions. Try them for keeping equipment on the job at low maintenance and low lubrication costs. Call the nearest Sinclair office, or write Sinclair Refining Company, 630 Fifth Avenue, New York, New York.

* * *

(Left) **T.D.***18 Model newest type International Tractor owned and operated by Schumacher & Shultz, Pottsville, Pa. Successfully lubricated in severe service with Sinclair lubricants.*

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

SINCLAIR LUBRICANTS-FUELS

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • 1907 Grand Avenue, Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

Every ounce of power and concentrated efforts is needed today on defense projects. Baker Equipment has the stamina to push such jobs to early completion.

Baker Hydraulic Bulldozer and Gradebuilders are getting the tough jobs today, finishing them and asking for more. Their easy control and efficient hydraulic system, backed by rugged construction, make them the choice of contractors who get things done.

Other Baker products are on the job, too—easy loading Hydraulic Scrapers, Rotary Scrapers for short hauls and Road Rooters to rip up tough places—and Baker Road Discs and Maintainers to help you keep important roads passable without heavy expense. Bakers are ready to do a real job for you—just call them in!

Write or Wire for Special Bulletins
on Any Baker Product

THE BAKER MFG. CO.

506 STANFORD AVE. SPRINGFIELD, ILLINOIS

BAKER
TRACTOR EQUIPMENT

BULLDOZERS, GRADEBUILDERS
ROAD ROOTERS, SCRAPERS
ROAD DISCS, MAINTAINERS
SNOW MOVING EQUIPMENT

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THE HOLLENDEN

In Cleveland's business center. 1050 rooms with bath and radio. 300-car garage in same building. Famous Vogue Room, popular-priced Coffee Shop.

In Columbus

THE NEIL HOUSE

Across from the State Capitol. 655 rooms, all with bath. New Century Room features dancing and entertainment.

In Akron

THE MAYFLOWER

One of the midwest's newest, finest hotels. In the center of downtown Akron. 450 rooms with bath and 4-station radio.

In Lancaster, O.

HOTEL LANCASTER

Ohio's newest hotel, completed Spring, 1940. 100 rooms with combination tub, shower bath.

In Corning, N.Y.

BARON STEUBEN HOTEL

Finest hotel in Corning. 100 rooms with bath at moderate rates. Garage in connection.

DeWITT OPERATED HOTELS

Check In

AT

DeWITT OPERATED HOTELS

The Hotels That Check With Every Travel Standard!

People who travel a lot set up a rigid code of the things they expect and demand in a good hotel. Because De Witt Hotels maintain such strict standards of excellence, they have long been favored by exacting travelers.

1. Rooms are large, cheerful and spotlessly clean. Beds are sleep-inviting.
2. Rates are surprisingly low for the service rendered.
3. There are restaurants to suit every mood ... good food at a price to suit every purse. Dance music and entertainment.
4. Employees are friendly, diligently trained, always alert to serve you.

DeWITT OPERATED HOTELS

THEODORE DeWITT, President • R. F. MARSH, Vice-President

Foto Facts
No. 4
PUBLISHED BY THE
PIONEER ENGINEERING WORKS
MINNEAPOLIS, MINN., U. S. A.

"Stone Chips" are required on many jobs for top dressing on black top roads. Some contractors buy them and ship them in to the job. Others make a special set-up with their crushing plant to produce the chips. Either method is too expensive.

Portable Gravel Plant Produces "STONE CHIPS"

This owner of a Pioneer Vibrator Duplex Crushing Plant produces "stone chips" while he is producing base course. He doesn't need to make a special set-up to run chips and he doesn't require any extra screens or equipment. It isn't even necessary to close down the crushers.

In the Pioneer Duplex Plant, the chips are produced as a by-product so they cost the same as the gravel. At the same time, excess sand can be rejected and crusher dust can either be rejected or mixed with the road gravel as may be preferred.

Screen Arrangement: Pit material goes onto the bottom deck — sand is rejected and specification material goes directly to the finished product hopper. Oversize from the bottom deck goes to the jaw crusher.

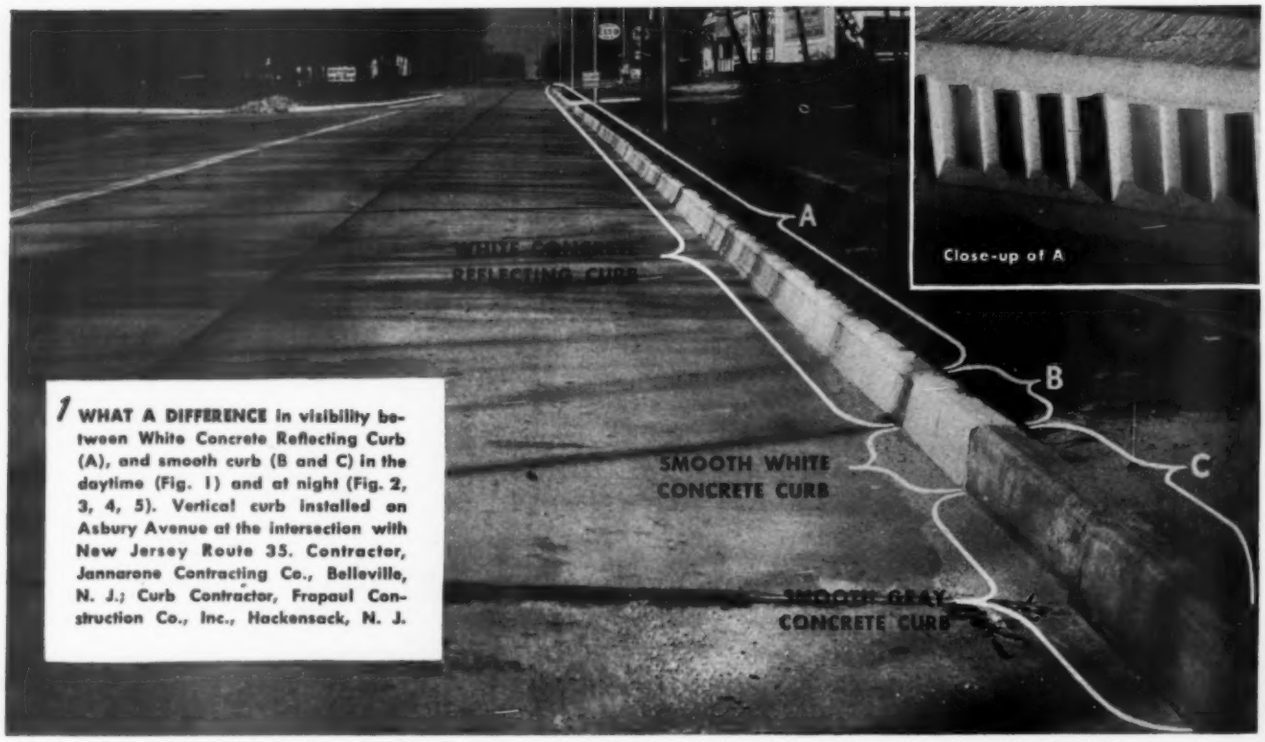
Crushed material is screened on the top deck. When producing "stone chips" the chips are screened thru the first half of the top deck — the crusher dust is taken out thru the middle deck and the chips are delivered out portholes on the side of the screen. The balance of the screen produces specification material and the oversize from the top deck goes to the roll crusher for further reduction.

With this ingenious screening and crushing arrangement, the Pioneer owner and operator has a flexible plant that will meet varying conditions. It will make road gravel, reject any percentage of sand, and will produce "stone chips".

PIONEER ENGINEERING WORKS
1515 CENTRAL AV., MINNEAPOLIS, MINN., U.S.A.

. . . HOW TO REDUCE NIGHT ACCIDENTS *with* WHITE CONCRETE REFLECTING CURB

The ABC Story of Safer Driving at Night Made Possible by New Jersey's Scientifically Designed Curb



1 **WHAT A DIFFERENCE** in visibility between White Concrete Reflecting Curb (A), and smooth curb (B and C) in the daytime (Fig. 1) and at night (Fig. 2, 3, 4, 5). Vertical curb installed on Asbury Avenue at the intersection with New Jersey Route 35. Contractor, Jannarone Contracting Co., Belleville, N. J.; Curb Contractor, Frapaul Construction Co., Inc., Hackensack, N. J.

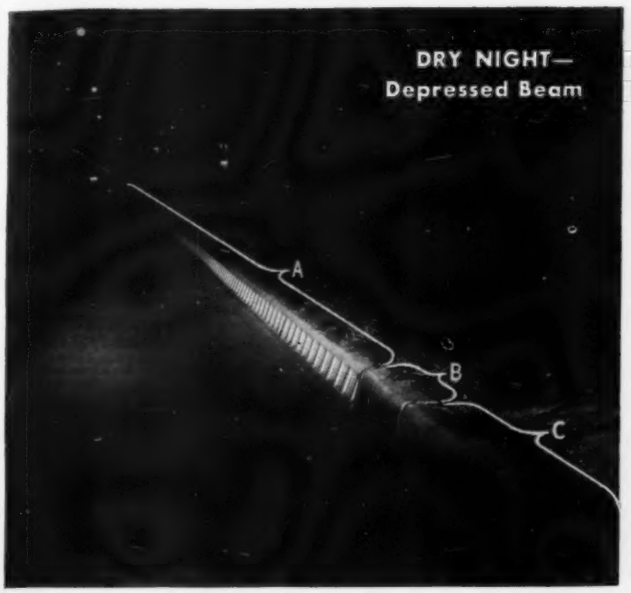
NEW CURB DESIGN—Now you can see exactly how the vitally important factors of visibility and driving safety vary with different kinds of curbing! These three types of curb—A, white concrete reflecting; B, smooth-troweled white concrete; C, smooth-troweled gray concrete—are actually installed and in daily use on this New Jersey road.

The greater driving safety of White Concrete Reflecting Curb is due to scientifically designed saw-tooth faces on the curb itself. These reflecting faces conserve the light—reflect the light directly back to the driver. With smooth curb (B and C), the headlight beams are wasted by reflection forward, away from the driver—making almost a complete blackout of smooth curb as shown on opposite page.

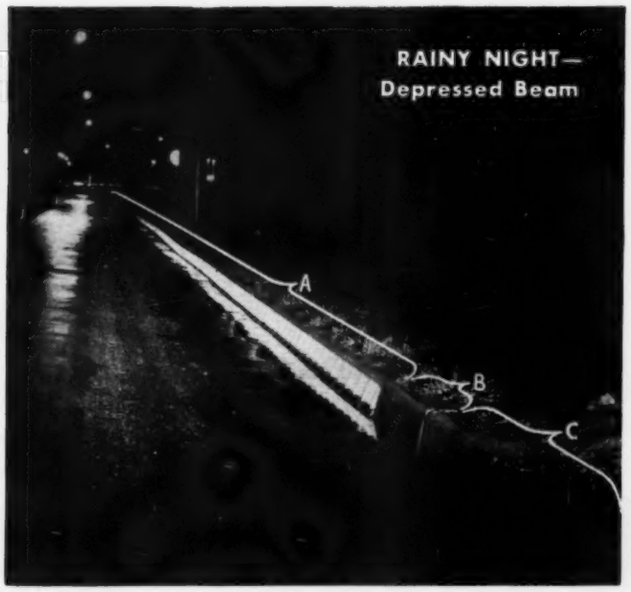
SEALED-BEAM HEADLIGHTS are one of the automotive industry's latest, most important contributions to safer driving. Note in the photos on opposite page how White Concrete Reflecting Curb (A) increases their effectiveness! Study also the way the light seems to slide off and lose itself in all four photographs when the sealed-beam headlights shine on smooth troweled curbs B and C. Even the best headlight does little good with smooth curb.

OVERHEAD ILLUMINATION—In all the pictures on opposite page, overhead lights were in use. Note especially that on rainy nights (photos 3 and 5) the overhead lights help make the surface of the road more visible. But note also that they never hinder the most important function of White Concrete Reflecting Curb — defining the road's edge, the driver's guide to safety.

HIGH VISIBILITY AT NIGHT WITH...



2 Note the high visibility of reflecting curb A, and the low visibility, even though in the foreground, of smooth curb B and C. (First two paragraphs on opposite page give the reason for the brilliance of curb A.)



3 This photo and picture 5 were taken during the worst rainstorm of the winter. But White Concrete Reflecting Curb is even more efficient—reflects even more light back to the driver on wet nights than on dry nights.

4 With headlights raised, visibility is increased all the way down the road. White Concrete Reflecting Curb defines the road's edge sharply as far as the eye can see.

5 The wetter the night, the brighter the gleam. The intensity of light on the curb A is indicated by the intensity of its reflection in the water on the road.

ALL THESE PICTURES ARE OF THE SAME STRETCH OF CURB. COMPARE THEM UP, DOWN, AND ACROSS FOR CONVINCING PROOF OF THE SUPERIORITY OF WHITE CONCRETE REFLECTING CURB.

▶ *Get the whole story of how White Concrete Reflecting Curb can make night driving safer at surprisingly low cost! Write to Universal Atlas Cement Co. (United States Steel Corp. Subsidiary), Chrysler Building, New York. Offices: New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

RS-M-19

WHITE CONCRETE REFLECTING CURB

MADE WITH ATLAS WHITE CEMENT

This 3/4 YD. MACHINE has MORE of EVERYTHING YOU NEED

MORE

THEW CENTER DRIVE

POWER —Thew Center Drive design gives you streamlined direct-to-the-point power. That means full engine power can be poured onto any one operation to turn the tough jobs into easy ones—or may be spread over simultaneous and synchronized operations to produce high-speed working cycles that mean big yardages.

CAPACITY —Balanced design of turntable, featuring the patented Sloping Machinery Frame, concentrates machinery farther back of the tipping point to develop greatest capacities per pound of weight.

STRENGTH —Center Drive design simplifies construction, permits use of fewer and stronger parts. That's why the "40A" stands up longer under harder work.

VERSATILITY —With plenty of power, capacity and strength in reserve, it stands to reason this ¾-yd. machine is a "whiz" at any kind of work. (Note illustration for proof.) Shovel, crane, dragline, backdigger or clamshell service—it's all the same to a Lorain-40A, and you can switch booms quickly and easily and always get top performance.

A brand new bulletin has just been printed to bring you latest "40A" facts and figures. Write for it.

UNIVERSAL CRANE DIVISION
THE THEW SHOVEL COMPANY
LORAIN, OHIO

LORAIN 40A

ROADS and STREETS

Vol. 84, No. 4 April, 1941

A GILLETTE PUBLICATION
ESTABLISHED 1906

DAM BRIDGE WIDENED OVER SPILLWAY

Work Had to be Done During Winter Months in Jackson Hole, Wyoming

CROSSING the Jackson Lake dam is U. S. 89 at Moran, Wyoming. It crossed on a narrow, one-way bridge deck roadway. The roadway is shown by Fig. 1. The bridge deck, of course, was necessary in order to cross the spillway. The new bridge deck

Fig. 1.—Bridge Across Spillway Before Widening

section, which rests upon the old piers that supported the narrow roadway, is 222 ft. long. The total length of the project is 1500 ft. The roadway will be 20 ft. wide between curbs when completed for the bridge deck section and the balance will be a 24 ft. bituminous surface on the fill. There is a difference of 49 ft. in elevation between the new bridge floor and the spillway tail race level. As will be noted by Fig. 1, the sluice gate operating equipment was lined up along one side of the roadway and the radial gate operating equipment was lined up along the other side. In the reconstruction, this equipment and the machinery necessary to operate it had to be moved laterally to provide for a 20 ft. roadway where a 10 ft. roadway previously existed. Fig. 2 shows a general view of the spillway section from the down-stream side with the old bridge deck crossing it.

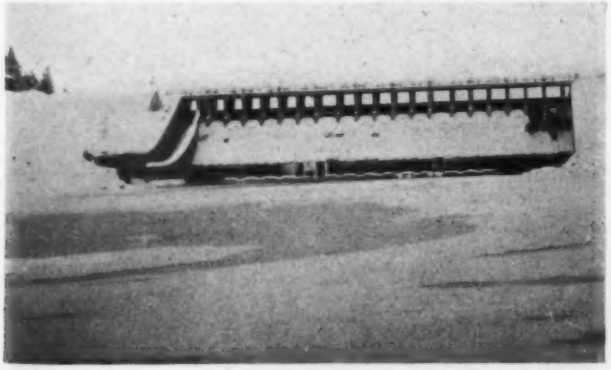


Fig. 2.—General View of Spillway of Jackson Lake Dam B fore Widening

Fig. 3.—View of Dam Spillway from Detour. Mt. Moran of the Tetan Range in Background

Fig. 4.—Demolition Work on Old Deck

Fig. 5.—Covered Portion Is Ready To Be Poured. Old Deck and Stringers Removed in Foreground

Widening

To do the construction work it was necessary to provide a detour across the river below the dam. Fig. 3 is a view of the spillway and bridge deck at the beginning of construction work by the contractor Chas. M. Smith of Thermopolis, Wyo. The photograph was taken from

Fig. 6.—Where Retaining Wall to Hold Roadway Fill Will Join the Widened Bridge Deck Section

the detour. Mr. Moran of the Teton range shows in the background.

The first step in the widening process was the demolition of the old, narrow deck. This is shown in Figs. 4 and 5. In Fig. 4 the men are using paving breakers and chisel and maul to remove the old concrete deck. In some cases, light charges of dynamite were used to break up the top of the pier sections.

Six lines of stringers originally connected the piers together. These are eliminated in the widening design. Fig. 5 shows part of the old deck removed and the tarpaulin covering over a section ready to be poured. Fig. 6 is a corner of the finished widened roadway of the first section poured. Note the reinforcing rods projecting where the handrail is to be poured. This picture was

Fig. 7.—Steel Brackets Support the Cantilevered Falsework Construction. Safety Floor in Place

taken to show how the contractor is preparing for the retaining wall that will carry the fill over the balance of the dam to where the roadway meets the natural ground. The retaining wall will reach up to the level of the bridge deck.

Cantilevered Sections.—The valve operating equipment will be carried on slabs cantilevered out from the old piers on each side of the roadway. Fig. 7 shows the way the contractor carried the cantilevered section for construction purposes. The man is standing on the safety floor over which the cantilevered sections will be formed

Fig. 8.—Closeup of Cantilevered Beam Section Over Old Pier

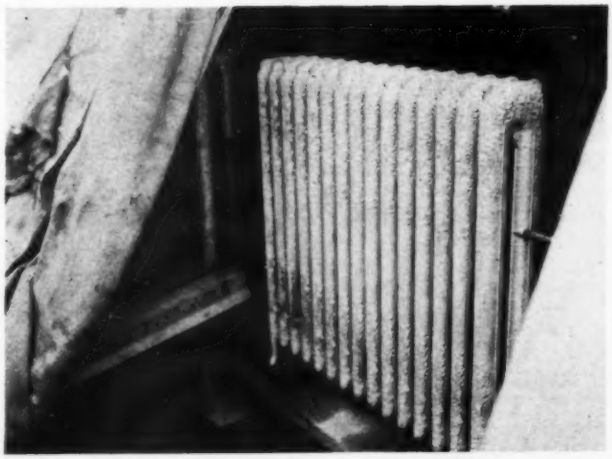


Fig. 9.—Ordinary Home Radiators Used To Keep Work at 50 Degs. Until Hardened

and poured. Long heavy bolts extend from brackets on one side to brackets on the opposite side of each pier to hold them in place. Fig. 8 is a view taken underneath the tarpaulin tenting shown in Fig. 5. It was taken to

Fig. 10.—Timber Bridge to Moran Replaced with 72 in. Corrugated Metal Pipe

show a beam section directly over a pier. The wood forming is the bottom of the cantilevered section. Slab and beam are poured monolithic. While the floor is being poured curb forms for the handrail are placed and the curb poured also.

Concreting.—The weather is cold but aggregate is obtained from a nearby pit and kept steamed and hot by jets from a steam boiler. High early strength cement is used in order to reduce the time required for keeping the job heated while curing. A temperature of 50 degs. F. must be maintained for 3 days after pouring. It is allowed to drop 20 degs. a day and the job must be kept covered until the inside temperature equals that outside. A steam boiler maintains a pressure of 25 lb. to supply steam to the radiators shown in Fig. 9. Enough of these radiators are used to keep the temperature up to that specified.

Fig. 11.—Project Engineer's Office at Moran, Wyo.

Approach Road

From the main road an approach road to the town of Moran, Wyoming, swung over a roadside stream. The old timber bridge that existed there was replaced with the 72 in. corrugated metal pipe shown by Fig. 10. As will be noted in the picture the culvert was prestressed before the fill was made. A General power shovel with four trucks was assisted by a Caterpillar tractor and Le Tourneau 12 yd. scraper in making the approach fill. A Caterpillar tractor and Le Tourneau bulldozer reduced the dump to about 8in. lifts. The fill material was very stony and rocky, some of the rocks were 12 in. and larger in diameter.

There is 11,000 cu. yd. of excavation involved, including that for the detour.

Personnel

This project is being constructed by Chas. M. Smith, Contractor, under the supervision of W. R. Hanson, Superintendent.

For the state highway department Talcott Moore is construction engineer. V. E. Larsen is engineer for the reclamation service, the Jackson Lake dam being one of their properties.

Fig. 12.—V. H. Williams, Project Engineer, Left. A. L. Putnam, Resident Engineer, Right

OBSERVATIONS BY THE WAY

By
A. PUDDLE JUMPER

¶ Complying with a request from Oliver Whitmer of Center, No. Dak. we republish the picture of the girls' pet, only part of it has been outlined so the picture is more readily envisioned. Writes Mr. Whitmer:

"Your picture of the girls' pet on

page 42 of the Feb. Roads and Streets is still a mystery. The outline on the next page doesn't seem to help a bit. Please publish the complete picture or a straight jacket will be proper wearing for your readers."

Can you recognize the cow now?

• •

¶ You really have to hand it to "Buck" Davis of Rhode Island. If he didn't fight so hard to prove he was living in a regular state we'd be afraid the place would be carried off by a dust storm some day.

• •

¶ By the way "Buck," is Rhode Island really a small piece of land off the Texas coast completely surrounded by water? I heard a guy say it was.

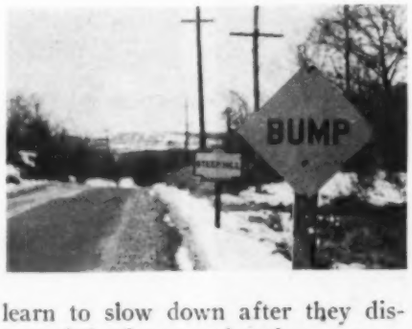
• •

¶ Down (or up) at the P. C. A. cocktail party in Boston during the annual convention (February) of the Association of State Highway Officials of the North Atlantic States, Bob Reindollar of Maryland was accused of rendering this bit of advice: "If they're old, they're young. If they're young, they're old. If they turn around, follow them."

• •

¶ If you are planning on making speed on U. S. 6 in Connecticut, stay off of it. It's one of the slowest, poorest roads I've traveled. You get nowhere fast.

¶ When you see one of these signs on a highway in New York State, heed it. It certainly means what it says. Many frost heaves required erection of these signs, and drivers



learn to slow down after they disregard the first one that they pass.

• •

¶ The activity around those booths in the hotel at Boston during the A. S. H. O. N. A. S. convention last February proved conclusively to A. P. J. that the American Road Builders' Association made a serious error at their January meeting in New York by not having booths for a sort of focal point where manufacturers could meet distributors and contractors, engineers and officials.

¶ Herewith is a picture of a sign, one of three, that I saw in Pennsylvania along that part of the Lincoln Highway, U. S. 30, which parallels the Pennsylvania Turnpike. Just who paid for these signs I did not take the time to learn.

The sign urges motorists to write to their legislators today. It ends by stating, "You pay for modernization. Ask for it." And that, my friends, is very true.

• •

¶ Now's the time to compliment Wyoming engineers on the way they turn out for the meetings of their Wyoming Engineering Society. Bill Schilling, a state highway department engineer at Casper deserves a big hand for the way he handled the banquet, entertainment, and dance. You did a swell job, Bill.

• •

¶ Incidentally (thanks to State Highway Engineer Seifried of Wyoming) A. P. J. had a grand evening at the Riverside Club in Casper. "Cy" is a regular guy.

• •

¶ Before I jump to Casper and Salt Lake City, I'd better remark about how well the banquet, entertainment, and dance was handled at Boston for the annual convention of the A. S. H. O. of the N. A. S. (What a helluva name!)

¶ It was the second night of the Highway Engineering Conference at the University of Utah under the able leadership of Prof. Diefendorf that the banquet was held. It was following the banquet that A. P. J. was accosted by a quintet of Utah highwaymen and inveigled into one of their Mormon bible classes where they study the four kings (with deuces wild). During and after the session, which broke up about 5:30 A. M., it was impressed many times upon A. P. J. that Utah certainly should get a big write up in the magazine. Well sir, the bigger A. P. J.'s stack of chips became, the bigger the write up that was demanded.

Now of course, it is not possible to devote the whole page to the write up but I'm sure that Andy, Carl, Maury, Lee and B. J. will be satisfied with these few remarks. I had an enjoyable evening, gentlemen, as I believe B. J. did too, and maybe the next time I'm through Salt Lake City we can again hold another study class. Some guys can't bluff worth sour apples, eh Major?

• •

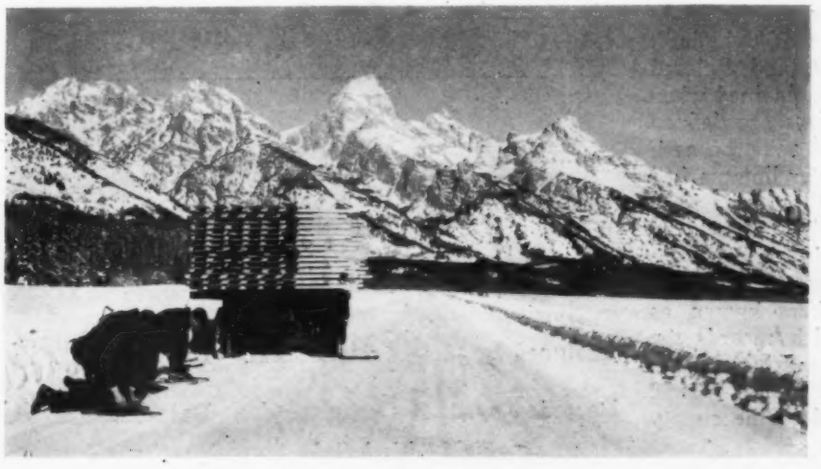
¶ "Pres" Peterson, one of Utah's state highway commissioners (and a regular guy) pulled a good story up at Logan the other night at an A. R. B. A. student chapter dinner we were attending. It was a story about the king's last ball coming off on time. Have him tell it to you some time.

• •

¶ Then there's that story the young student toastmaster told during the dinner at Logan, Utah; said he, "Bill, do you know what two old maids in an airplane are?" No, Jim, what are two old maids in an airplane?" "Why, passengers, dummy."

• •

¶ Erecting snow fence north of Moose, Wyoming. State highway maintenance men are putting the webs on the fence prior to erection. The Teton Range rises proudly in the distance. This is just south of Yellowstone Park. Picture was taken Feb. 5, 1941.



• •

¶ U. S. 91 is a rather dangerous road over the pass into Cache Valley, Utah, from the south. There should be a great deal of guard cable or rail installed. That narrow road with its sharp, blind curves is a hazard even for normal driving from Ogden to Logan.

• •

¶ Deck of Jackson Lake dam bridge at Moran, Wyoming, prior to widening operations that started in February.

• •

¶ While talking about dangerous roads I suggest that the road from Casper to Shoshoni, Wyoming, be made non-skid over those "fat" spots. On one curve I skidded nearly 150 ft. before I could control the direction of the car. I was only traveling 70 m.p.h. besides, but the fresh snow had melted and made the "fat" spot quite slippery. Bill Schilling if that stretch is under your jurisdiction I suggest you "chip" about 25 or 30 places.

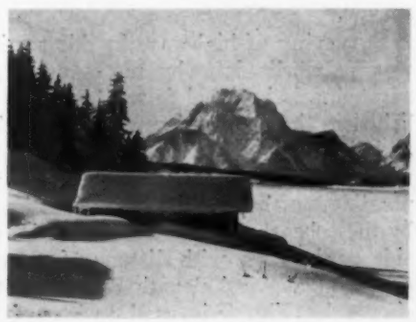
¶ Going over Twogwotee Pass into the Jackson Hole country of the Teton Mountains I stopped on the grade near the summit. The pass crosses above 9000 ft. Fresh snow was falling and I had no chains. Imagine the job that Resident Engineer Putnam had in getting me moving again on that soft white snow. Twogwotee Pass is kept open but the snow was falling so fast that the differential on my car dragged before I got down to the elevation of Moran in the Hole.

• •

¶ If you want to see a sight, you should see the elk and deer in droves grazing in their natural state in the Hoback Mountains. At times I had to slow down to 20 or 25 m.p.h. to give the deer time to get out of my way as they crossed the highway. Thousands of these wild creatures graze the mountain slopes and valleys.

• •

¶ Jackson Hole country in the winter time. This is view of Mt. Moran in the Tetons, looking west across the lake from the south approach to the bridge over the dam. This was a 22 in. snow fall on Jan. 9, 1941. Mt. Moran rises to about 1400 ft. elevation in the rugged Teton range. Efficient, effective snow removal on the main roads open these vistas to the winter traveler.



RECORDS CONTROL COUNTY ENGINEERING WORK

In Worcester County, Massachusetts County has No Control of Road Construction

By L. O. MARDEN
County Engineer, Worcester County, Mass.

COUNTY engineering in Worcester County, Massachusetts, has principally to do with engineering for county highway layouts for town road work. However, the county engineer also has engineering supervision over dams within the county. To systematize his engineering work on the roads the county engineer has developed several forms and reports that are evidences of actions taken and procedure to date.

Beginning of Project

The first evidence, besides talks and meetings held, that a section of the town or county desires a road, which comes to the attention of the County Commissioners is the petition requesting that a certain road be built. Figure 1 is a reproduction of such a petition. It is made out and signed by six voters, and, accompanied by a filing fee of $3.00 is presented to the county board. The commissioners hold a hearing on the petition and if no objection is filed, surveys are ordered, after thirty days have elapsed.

The Work Order for the surveys is made out by the county engineer after the county commissioners have ordered the laying out and construction of the road. A copy of a work order is shown by Figure 2. Figure 3 shows the record of a petition for a road, that is kept in the county engineer's office. The original petition is filed with the proceedings of the county commissioners.

The survey party chief draws the equipment he needs for making a survey and files the record shown in Figure 4. It is a receipt for the engineering equipment. Armed with hte work order the party chief starts the survey.

Surveying of highways in this section of the country was formerly done by metes and bounds. Today all surveying is in lineal feet. Base lines are usually established in the proposed center line of the road to be built and tied into known or identifiable points and a closed survey run. True town line bearings are obtained when possible, so that the highway location lines are defined by these bearings. Stakes are set 50 feet apart on each side of the road, with distance from center line marked on each stake and elevation taken on the top. The form shown by Fig. 5 is used to record daily progress of the surveys. The highway location is tied in with the division lines between abutters and any new location identified by concrete or granite markers known as "bounds." Figure 6 is a tie sheet which records the location of the bounds with respect to nearby existing land marks. In this case the "bound" at Sta. 42+64.52 is definitely located and the record filed in the county engineer's office.

To the Honorable County Commissioners of the County of Worcester:

Respectfully represent the undersigned petitioners, being inhabitants of the County of Worcester, that common convenience and necessity require the lay out, alteration, relocation, and discontinuance, and specific repairs of a highway in the town of Paxton in said County, described as follows: Rockland Street, so called, beginning at the Paxton-Rutland Town Line and extending southwesterly about nine tenths of a mile to the Paxton-Spencer Town Line

Wherefore your Petitioners pray that you will, after due notice, view and hearing, as soon as may be, proceed to lay out, relocate, alter, discontinue or specifically repair such highway.

Dated this 4th day of January 1939

K. Martin Stafford — Leonard C. Corcoran
Wallace O. Finlayson — Oscar L. Marden
Edmond E. Brigham — Daniel P. St John
Wesley A. Herholz — Maurice F. Campbell

Fig. 1.—Petition for a Road

Work Order

Project Paxton – Rockland ST

Assigned to J. A. Herholz

Work Assigned Survey from Rutland Town Line south westerly to Spencer Town Line

Commenced 3-3-39 Completed 4-3-39

Signed J A Herholz

Assigned by L O Marden Date 3-3-39

Recorded by Fa Perry Date 4-4-39

Fig. 2.—Work Order Starts Surveying

TOWN
CITY OF ASHBURNHAM DECREE NO. 907
PLAN NO.

Water Street; Beginning at Ashburnham Center and running northerly to Ashby-Hindge State Road in Ashburnham

PETITIONERS: George F. Willard et al NAME OF ROAD Water Street
DATE OF FILING: Jan. 13,1931
PLAN AND DATE OF HEARING: Feb.25.1931
DISPOSITION OF ACTION:
TYPE OF ROAD:
DATE OF DECREE: (PARTIAL) Sept.4,1931, ~~March 25,1932~~, June 17,1933.

DATE OF DECREE: (FINAL)
COPY OF DECREE RECORDED IN REGISTRY OF DEEDS: Sept.5,1931 March 28,1932 June17,1932
COPY OF DECREE MAILED TO TOWN CLERK: Sept.5,1931 ~~March~~28,1932 June 17,1932

Fig. 3.—Engineer's Record of a Petition

COMMONWEALTH OF MASSACHUSETTS

WORCESTER COUNTY ENGINEERING DEPARTMENT

-- oo --

ENGINEER'S SUPPLIES

Supplies to ..J.H.Hanbury.. as ..Engineer.
Date Supplied ..3-3-39.. Date Returned .....

100 ft. Steel Tape,	No.4	Plan,	Sta.	to Sta.	
50 ft. Steel Tape,	No.	Profile,	Sta.	to Sta.	
25 ft. Steel Tape,	No.	Original Sects.	Sta.	to Sta.	
50 ft. Cloth Tape,	No.1	Semi-final "	Sta.	to Sta.	
( ) Plumb Bobs,	No.	Final Sects.	Sta.	to Sta.	
Transit & Tripod,	No.26391	Blueprints,	Sta.	to Sta.	
Level Rod,	No.	Quantity Sheets	Sta.	to Sta.	
Leather Bag,	No.1	Stake Sheet,	Sta.	to Sta.	
Sketch Book,	No.	Tie Sheet,	Sta.	to Sta.	
Calculation Book,	No.	Detail Sheet,	Sta.	to Sta.	
Survey Book,	No.114	Decree Plan,	Sta.	to Sta.	
Miscellaneous		Bridge Plan,	Sta.		

I hereby acknowledge receipt of the above articles from the Worcester County Engineering Department, for which, unless transferred to another on a written order from the office, I agree to be responsible and to return to the office of the Department in good condition.

J.H.Hanbury Engineer.

Remarks,
Town-City of Paxton Road...Rockland St.

Please sign and return this receipt to
Worcester County Engineering Department, Court House Annex.
Worcester, Mass.

Fig. 4.—Receipt of Surveying Equipment

3 SHEETS—SHEET NO. 3

TIE SHEET

TOWN—CITY OF Paxton 1939 LAYOUT MADE BY Fuss
FIELD—BOOK 114 PAGE 65 TOTAL NO. BOUNDS 30 CHECKED BY K.H.F.

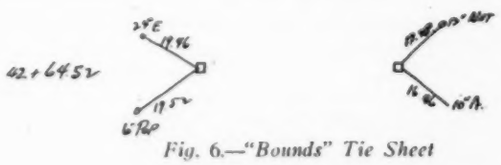


Fig. 6.—"Bounds" Tie Sheet

Field and Office Work

While the office crew calculates the closed surveys over the site of the proposed road, the county engineer abstracts the names of all abuttors and mortgagees. The proposed line has, by this time been approximately located so that land owners can be shown the amount of land to be taken from them account a new location. All abuttors and mortgagees are notified to be present at the site of the proposed route upon a specified day when representatives from the county board will be along to get their signature to a release from damages account the land to be taken by easement necessary for construction of the new road. Ownership in fee simple still remains in the names of the abuttors. Figure 7 is the county engineer's record of abstract of each abutting piece of property. The official release for easement to the necessary right-of-way needed is shown by Fig. 8.

COUNTY OF WORCESTER

Office of County Engineer
Court House, Worcester, Mass.

Daily Report of Surveys

3 - 3 1939

Town Paxton
Weather Fair
Decree No. 1701
Plan H-2704R
Road Rockland St
Book 114 Page 56

Chief of Party J.A.H.
Transitman R.N.B.
Levelman J.B.T.
Chainman
Rodman

Work done to-day	Sta. to Sta.	Total previously done, Lin. Ft.	Total to Date, Lin. Ft.
Center Line Run	0 - 10	0	1000
Center Line Rerun			
Staking			
Reset Stakes			
Topography			
Bench Levels			
Cross Sections—Preliminary			
Cross Sections—Final			
Cross Sections—Gravel Pit—Prelim.			
Cross Sections—Gravel Pit—Final			
Levels on Stakes			
Culvert Staking			
Bridge Staking			
Stakes for Bounds			
No. Bounds Set			
No. Bounds Found	4 - RUN TO O/A LINE		

Approximate total length of survey in Lin. Ft. 4600
Station beginning day 0
Station end day 10
Kind of car used Suburban 54730
Mileage reading, Beginning Day 30841
Mileage returning, End of Day 30862

Signed J.H.Hanbury Chief of Party

Fig. 5.—Daily Report of Survey Work Completed

WORCESTER COUNTY ENGINEER
WORCESTER, MASS

SHEET NO 1
DATE 6-2-39

Town Paxton Name of Highway Rockland St
Decree No 1701 Plan No H2704 Names obtained by JAH
Name checked in Registry of Deeds by RNB Name checked in Probate RNB

Name of Property Owner obtained in Field John Hamilton
Date property purchased 1925 Purchased from George French
Name of husband or wife if joint ownership Etta Hamilton
Mortgage None By will
If Estate-Probate Court Book No. Page No.
Name of Deceased
Names of Heirs

REGISTRY OF DEEDS

Kind of Deed Warranty Book 2541 Page 497 Date Jun 17 1925
Plan Book No 46 Plan No 18 Name of Surveyor W.T. Thompson
Grantor George E. French Grantee John G & Etta G. Hamilton
Dower(or curtesy) and Released by Mary E French
Holder of First Mortgage Address
Holder of Second Mortgage Address
Remarks
Land Court Certificate No Document No

Fig. 7.—County Engineer's Record of Abstract of Abutting Property Owners, and Mortgagees

SHEET NO. 1

Survey Book 114 Date 5-10 1939 Name of Road Rockland St Town of Paxton

Sta. 0-47-16 to Sta. 46-63-57 Surveyed by J.A.H. Calculated by B.S.L. Checked by L.H.S. Plotted by J.A.H.

Left.	Right.	Station.	Sub. Tan.	Distance	Bearing	N.	S.	E.	W.	Total.	Total.
				0							
29°58'00			133.82	432.16	55-56-03 E		429.845	44.673		429.845	44.673
	19-54-20		210.57	1176.17	535-54-03 E		952.747	689.674		1382.592	734.347
	18-21-15		117.07	670.02	515-59-43 E		644.082	184.620		2026.674	918.967
	5-30-05			601.88	52-38-28 E		601.240	27.740		2627.914	946.707
	18-41-35		164.93	404.00	57-57-37 W		403.496		20.166	3031.410	926.541
11-25-30			100.03	554.96	517-06-12 W		530.419		163.206	3561.829	763.335
11-26.00			100.11	547.54	55-40-40 W		544.854		54.170	4106.683	709.165
				382.53	55-45-18 E		380.621	38.364		4487.304	747.534
	Townline crosses			0-47.16	Bearing	N 59°32'57" E					
				and 46+63.51	Bearing	N 88-32-16 E					

Fig. 9a.—Sheet for Caculation of Bearings of Lines by Means of Latitudes and Departures

The County Commissioners then sign the Decree (which includes the description of the location lines) and plans by which the road is laid out as a county highway. This decree orders the town to build the road, specifies the type of construction and sets the date of completion. The County Commissioners may take land for highway purposes by easement, without signature of owners on a release. During the progress of the work in getting the easements for the necessary right-of-way, the office force has made good progress in the preparation of plans. All calculations for bearings are done by the method of latitudes and departures. Figures 9a and 9b are the forms used for these calculations. Natural trigonometric functions and calculating machines are used in place of log tables. The use of calculating machines cuts the work in half as compared with the use of logarithms.

Alignment and Quantities

Having plotted and mapped the area as surveyed, the new line is established, grades are laid, cross sections plotted, and quantities calculated. The sheet shown by Fig. 10 is that used for calculating quantities. No soil surveys are made. A flat percentage, as high as 25 per cent at times, is allowed for shrinkage and waste in calculating the quantities.

After all quantities are calculated, the estimate sheet is prepared. In the case of the estimate shown in Fig. 11, grading and gravel only are considered. The road was given a gravel surface.

The next step is the preparation of the stake sheet. Cut and fill data are then marked on the stakes in the field. The sheet is shown by Fig. 12. Road construction is handled by the town highway superintendents under the direction of a Resident Engineer from the Mass.

Survey Book 114 DATE 5-10 1939 NAME OF ROAD Rockland St TOWN OF Paxton

429.845	LOG.		530.419	
5°-56'-00	COS.	9946428	17°-06-10	9557788
432.16	LOG. (NUM.)		554.96	
	SIN.	1033712		2940867
44673	LOG.		163.206	
952.747	LOG.		544.854	
35°-54-00	COS.	8100416	5-40-40	9950944
1176.17	LOG. (NUM.)		547.54	
	SIN.	5863724		0989338
689.674	LOG.		54.170	
644.082	LOG.		380 621	
15°-59'-40	COS.	9612844	5-45-20	9949588
670.02	LOG. (NUM.)		382.53	
	SIN.	2755841		1002817
184.620	LOG.		38.364	
601.240	LOG.			
2-38-30	COS.	9989373		
601.88	LOG. (NUM.)			
	SIN.	0460896		
27.740	LOG.			
403.496	LOG.			
2-51-40	COS.	9987535		
404.00	LOG. (NUM.)			
	SIN.	0499151		
20.166	LOG.			

Fig. 9b.—Calculation of Latitudes and Departures by Use of Natural Functions and a Calculating Machine

The Commonwealth of Massachusetts

WORCESTER COUNTY COMMISSIONERS

Whereas, the County Commissioners of Worcester County have been petitioned to lay out, alter, relocate and specifically repair a highway in the town of Paxton known as Rockland St commencing at Rutland - Paxton Town line and extending Spencer - Paxton Town line

Whereas, the layout, relocation, alteration and specific repairs of said road may be upon a portion of our land, and the grade and drainage of said road may be changed, now, in consideration of the above premises we hereby release the said County of Worcester and town of Paxton from any and all damages or claim whatever caused by said changes of grade and drainage, the taking of said land or the extension of slopes on embankments or excavations.

And we hereby covenant and agree to and with said County and town that we will bring no action by petition, or otherwise, to recover any damages suffered by us in consequence of any decree based upon said petition or for anything mentioned in this release.

In witness whereof we have hereto set our hands and seals this 8th day of July A. D., 1939

John G Hamilton
Etta A. Hamilton

Fig. 8.—Form for Obtaining Easement for Right-of-Way

Sta.	Dist.	End Area Cut	End Area Fill	Σ End Areas Cut	Σ End Areas Fill	Quantities Cut	Quantities Fill	Remarks

Fig. 10.—Grading Quantities Calculation Sheet

Order No..... Sheet 1 of 1 Sheets

THE COMMONWEALTH OF MASSACHUSETTS
Worcester County Engineering Department
19 Court Street, Worcester, Mass.

PRELIMINARY ESTIMATE OF QUANTITIES - DETAIL SHEET

Town, City Paxton Road Rockland St Year 1939
Sta. 0 to Sta. 46 Class ..... 19.....
Date July 12 19 39

Earth Excavation	33.00 Cu.Yds.	Gravel Sub-grade	34.00
Ledge Excavation	3.00 Cu.Yds.	Gravel for Bridge	
Ordinary Borrow	2700 Cu.Yds.	Gravel Sidewalks	
Embankment	Cu.Yds.	Gravel (Miscel.)	

Fig. 11.—Estimate of Quantities for Job

Dept. of Public Works. Bounds are set to the nearest hundredth of a foot by the Worcester County Engineering Department. Figure 13 shows the county engineer's record of the delivery and setting of the bounds. Figure 13a shows details of a concrete bound. Figure 13b shows details of a granite bound.

After the job is completed, all records are filed in the engineer's office in steel filing cabinets, or in a vault. All record plans and tracings are filed in the county engineeer's vault where he has, also, all of the old records of the road work of the county, going back to the establishment of the first road in or prior to the year 1732.

Reference Records and Expense Accounts

The card shown by Fig. 14 is an index card record to show where field records are filed and where computations can be found. This is made up after each job is finished.

Jan—1-'39
No. 1888

MADE BY L.O. Perry
CHECKED BY H.C. Marden

3 SHEETS — SHEET NO. 1

STAKE SHEET

TOWN - CITY OF Paxton 1935 L.O. FIELD BOOK X-14 PAGE PROFILE NO.

STATION		LEFT STAKE D.	LEFT STAKE M.O.	LEFT STAKE +OR-	LEFT STAKE ELEV.	GRADE		RIGHT STAKE ELEV.	RIGHT STAKE +OR-	RIGHT STAKE M.O.	RIGHT STAKE D.
0	-	35.0		+1.29	191	04	189	33			
	+	28.4		+1.34	197	89	198	97			
1	-	30.0		+1.46	197	35	198	95			
	+	29.8		+1.18	197	92	199	04			
2	-	31.4		+1.38	198	04	199	36			
	+	30.1		+1.48	198	32	199	68			
3	-	29.8		+0.11	199	01	200	00			
	+	27.4		+1.46	198	98	200	32			
4	-	25.1		+2.90	197	89	200	64			
	+	28.0		+2.56	197	56	200	96			
5	-	31.3		+2.88	197	76	201	47			

Fig. 12.—Notes for Setting Slope Stakes

TOWN Paxton ROAD Rockland St

BOUNDS DELIVERED Date	Engineer	No.	Remarks	BOUNDS SET Date	Engineer	Sta. to Sta.	No.	Remarks
Feb 39	JJC	30		8-11-39	HAC	0 - 28	16	
				8-12-39	HAC	28 - 46	14	

Sta.	Left	Right	Sta.	Left	Right	Sta.	Left	Right
0-47	1	1	46+63.51	1	1			
2+20.13	1	1						
6+42.46	1	1						
13+91.44	1	1						

Fig. 13.—Bound Sheet. Record of Those Delivered and Set

TOWN HIGHWAY

FIELD BOOK No.	Pages	Type Work	Sta. to Sta.	CALC BOOK No.	Pages	REMARKS	PLAN No.	PET No.	DATE

Fig. 14.—Field Records and Computations Index Card

TOWN OR CITY TRUNK LINE NO. SEC. NO. PLAN NO.
KIND OF HIGHWAY DECREE NO. C. C. DOCKET NO.

CLASSIFICATION OF WORK — ENGINEER (Enter When Commenced) — DATE (Time When Completed) — REMARKS

NOTES: Survey Made by; Elevations Computed; Checked; Notes in Book No.; Notes Plotted; Checked
PLOTTING: Preliminary Drawn; Inspection Made
GRADES: Quantities Computed; Checked
QUANTITIES: Estimate Computed; Checked
ESTIMATE: Tracings Made; Checked
TRACINGS: Surveys Made; Plans Drawn; Tracings Checked
LAND TAKINGS
GENERAL INFORMATION

Fig. 15.—Decree Road Plans Vault Filing Card

Date

WORCESTER COUNTY COMMISSIONERS

To

DATE	TOWN	ITEMS	AM'T	FROM	TO	AUTOMOBILE AT CENTS PER MILE MILES	AM'T

Fig. 16.—Expense Account Form. Place for Signature is Provided at Bottom

Worcester County Engineering Department

REPORT OF SERVICE CARS

Car No. 56930 Assigned to J.J. Cahill Period March 1 1939 to April 1 1939

Date	Destination Reason	Car Used From & To	Miles	Time Out	Time In
3-3-39	Sept-Jobs		21	8	5

Fig. 17.—Record of Service from County Cars. Kept on 5-inch by 7-inch Cards

Worcester County
Commissioners, County Engineer

PAYROLL

Men employed on Rockland St - Boston

For week ending Aug 12 19 38

Names of Men Employed	Kind of Service	Hrs. Employed	Total No. Hours	Rate per Hour	Amount
John Brown	Labor	8	16	0 50	8 00
Harry Smith	Labor	8	16	0 50	8 00
Daniel Doyle	Labor	8	16	0 50	8 00
Bert Farar	Labor	8	16	0 50	8 00
Kenneth Suitz	Foreman	8	16	0 75	12 00
Total					44 00
Labor cost per Rd			$1.46		

Fig. 18.—Payroll Form Used. Labor Listed Was for S.tting Bounds

Commonwealth of Massachusetts.

Worcester, ss.

At a meeting of the County Commissioners of the County of Worcester begun and holden at Worcester, within and for said County, on the fourth Tuesday of December, A. D. 19 40, and by adjournment on the second day of January, A. D. 19 41.

at which meeting being present,

Elbert M.Crockett Esq.,

George W.Jones Esq.,

Francis F.Cassidy Esq.,

County Commissioners.

Upon the petition of Irving L.Button et ali, filed with the Clerk on May 31,1940 and thence pending by due adjournment and continuance until the present time for

And said town of Boylston is hereby ordered to build and make specific repairs to said highway in accordance with the standard specifications of the Dept. of Public Works, and under the direction of the Engineer of said Department.

Work under this decree to be completed by July 1,1941.

This is a partial decree.

Elbert M. Crockett
George W. Jones
Francis F. Cassidy

County Commissioners

Fig. 19.—Completion Notice and Official Notice of Job Is Turned Over to Town for Maintenance by County Commissioners

Figure 15 is an index record card of all plans that are filed in the vault. This record is kept for decree road plans only.

Lodging and meals are paid for field parties assigned to jobs away from headquarters over night. These records are kept as shown by Fig. 16. Figure 17 is a record kept on the car expense of county owned automobiles. The pay roll forms used for engineering work for the county are shown by Fig. 18. These are certified as being correct and reasonable by the county engineer. The sample shown was for setting bounds on a road survey.

Upon completion of both the engineering and construction, final payment is made by the Board of County Commissioners for their share of the cost of the road, after the County Commissioners have viewed the completed highway.

Figure 19 is the form used. This particular reproduction shows only the first and last portions of the

VOLUME ____ PAGE ____ DATE ____

DECREE NO. ____ PLAN NO. ____

LOCATION -

GENERAL DESCRIPTION -

WIDTH OF LAYOUT ____ LENGTH OF LAYOUT ____

Fig. 20.—Index Card for All Roads in County

TOWN or CITY Holden		HEARING 6-21-35	PETITION NO. 1111
NAME of STREET Reservoir St		LIED HEARING July 11, 1938	PLAN NO. H2646R
ALLOTMENTS FOR PROJECT		WORCESTER COUNTY ENGINEERING DEPARTMENT	
STATE 5000 / COUNTY 2500 / TOWN 2500		1938 PROJECT / SURVEY BY COUNTY ✓ / BY STATE	
1938 CONSTRUCTION		STADIA COMMENCED None. / BASE LINE 3-22-35 STA.	
BEGIN OF 1938 CONST / PROPOSED LENGTH / PROPOSED END		STADIA COMPLETED " / BASE LINE STA.	
STA. 91+50 / 1938 2850 / STA. 120+0		PLAN AND PROFILE	
TYPE OF IMPROVEMENT		STADIA COMMENCED Assn. / P & P 4-12-35 STA. 104	
WIDTH 20 feet / SURFACE 2" Bituminous Gravel (Var.) 12 Gal. Tar per sq. yd.		STADIA COMPLETED " / P & P 4-25-35 STA. 140	
SUB-BASE 16 Gravel 20ft wide		CROSS SECTIONS	
REMARKS / DATE		SURVEY COMM. STA. / PLOTTING 4-12-35 STA. 104	
BLUEPRINTS TO SELECTMEN 6-7-38		SURVEY COMP. STA. / PLOTTING 4-25-35 STA. 140	
BLUEPRINTS & CROSS SECTIONS TO STATE 4-25-35		TRACINGS	
CONSTRUCTION PRINTS SENT BY STATE 5-31-35		COMMENCED 4-18-38 STA. 100	
CONSTRUCTION PRINTS RETURNED TO STATE 6-1-35		COMPLETED 7-1-38 STA. 140	
PROJECT STATEMENT FROM STATE 9-9-38		LAYOUT	
VOTE ON ALLOTMENT BY TOWN		COMP. COMMENCED 5-27-38 STA. 100	
CONSTRUCTION OF PROJECT / CONTRACT NO.		COMP. COMPLETED 6-29-38 STA. 140	
WORK BEGUN 9-8-38 STA. 91+50		TRACING COMMENCED STA. 100	
" CLOSED DOWN		TRACING COMPLETED 7-12-38 STA. 140	
" REOPENED 5-2-39		LAYOUT SIGNED BY COUNTY COMMISSIONERS 7-12-38	
" FINISHED 9-27-39 STA. 120+0		BOUNDS	
		SURVEY COMMENCED 11-19-38 STA. 110+	
		SURVEY COMPLETED 11-19-38 STA.	
		SETTING COMMENCED 11-20-38 STA. 110+	
		SETTING COMPLETED 7-20-39 STA. 140	

Fig. 21.—Record of Status of Each Petition and Project

TOWN or CITY	19 CHAPTER 90 MAINTENANCE							
NAME of STREET	DESCRIPTION OF LOCATION							
ROUTE NO.								
TOTAL LENGTH	LENGTH BUILT	LENGTH TO BE MAINTAINED	EST. OF COST PER FOOT	PRELIM. EST. OF MAINT. COST	AMOUNT REQUESTED	ALLOTMENTS STATE	ALLOTMENTS COUNTY	ALLOTMENTS TOWN
	DESCRIPTION OF LOCATION							

Fig. 22.—Progress Report Card on Chapter 90 Maintenance

decree. The descriptive part of the road line was removed in order to shorten the reproduction.

In order that the county engineeer may have a record of all decree roads in the county, the card, Fig. 20, was prepared. It is used to describe all roads in the county as they were described in the old minutes of previous board meetings and on decrees passed establishing the road.

The card shown by Fig. 21 is a complete progress record of the engineering and construction of a decreed road. This record is also kept by the county engineer. From it he may be able to tell at a glance just the status of a particular project.

State aid is given to the towns of Massachusetts for construction and maintenance of town roads. The county engineer keeps a record of those roads classed as a state aid road. Locally the maintenance work on

these routes is known as Chapter 90 Maintenance. The county engineer's record of these roads is kept on a card shown in figure 22.

Standards

Field survey parties are provided with a set of typical notes for various types of surveying work. It is expected that they will adhere to those standards. Also, field parties are equipped with a set of instructions on how the surveys shall be conducted.

With all of these forms properly prepared the county engineer has accurate knowledge of town road work within the county at all times.

NEW SPECIFICATIONS FOR LOW-ALLOY STRUCTURAL STEEL

As the result of a very constructive series of meetings held in Washington during American Society for Testing Materials Committee Week, March 3 to 7, Committee A-1 on Steel approved for reference to letter ballot of its some 229 members six proposed new specifications. One of these covers low-alloy structural steel. These new specifications developed in a section headed by C. F. Goodrich, Chief Engineer, American Bridge Co., cover material with a composition conductive to weldability, intended primarily for use as main stress-carrying material of structural members. These specifications are limited to material not under 3/16 in. and not over 2 in. in thickness. The maximum permissible carbon in ladle analysis is 0.20 per cent (check analysis, 0.22) and the maximum manganese is 1.00 (check analysis, 1.05). It is stipulated that the manufacturers shall use alloying elements which, combined with the carbon, manganese and sulfur limits, will produce properties meeting the minimum specified. Because of the intensive interest in welding, the subcommittee has included a note indicating that if steel is purchased for this purpose, the suitability of the chemical composition to be furnished shall be based upon evidence acceptable to the purchaser. The tensile strengths required for this grade of steel range from 63,000 to 75,000 psi. depending upon the thickness range and the relatively high yield points which characterize various compositions coming in this class range from 40,000 for material over 1½ in. to 2 in., incl., in thickness to 50,000 psi. for thinner material. Many of these types of steels have come on the market in recent years.

Texas Asphalt Program Covers 1,768 Miles.—The State Highway Commission of Texas has approved the initial 1941 state-wide asphalt program. The program in general extends over the entire state and includes 200 projects in 128 counties. The total estimated cost of the asphalt program is $2,434,100, and is made up as follows:

	Miles
Seal Coats	870
Reconditioning Base and Asphalt Surface	88
Asphalt Leveling Course and Seal Coat	386
Heavy Asphalt Surface	237
Widening Existing Surface or Shoulder Surfacing	103
New Asphalt Surfacing	84
Total	1,768

60 projects totaling 30 per cent of the total miles of construction are located on the designated Military System.

WAR TIME NOTES ON ROADS IN ENGLAND

From the February 1 and March 1 issues of Roads and Road Construction, London, England.

Road Transport Scheme

An important step to increase the efficiency of goods transport for war purposes has been announced by the Ministry of Transport. The broad principles of the new scheme, which affects road transport, have been formulated in collaboration with the Road Haulage Consultative Committee.

The Ministry of Transport will operate the scheme with the assistance of qualified men experienced in the industry who will be invited to join the Ministry for that purpose.

Under this scheme the Government will hire vehicles primarily to carry traffic on Government account. The running and maintenance of the vehicles will remain in the hands of the owners, but an official organization is to be set up, staffed partly by Civil Servants and partly by the experts taken from the industry to control traffic operation.

By these means it will be possible to give ready priority to the rapid movement of Government goods and to ensure that full and continuous use is made of the carrying capacity of the vehicles. The Government have often found that existing methods are wasteful and this arrangement will enable a more efficient system to be established. Recent events, moreover, have shown it is desirable to be able to switch transport from one place to another to meet sudden demands with a minimum of delay, and in short the new scheme aims to give effect to priorities, to promote flexibility and to ensure expedition.

The scheme is not a grandiose one. It has resulted from 16 months' experience of the emergency organization set up for road transport on the outbreak of hostilities and of the operation of the Meat Transport Pool. The emergency organization will continue and will only be superseded in part by the new scheme.

As a first step arrangements will be made by the Ministry of Transport with other Government Departments (such as the Ministries of Food and Supply) for carrying regular blocks of Government traffic. Expansion therefore will depend upon the measure of its success though, whether it expands or not, it will have to enter the field of commercial haulage to a certain extent. Otherwise it would hardly be possible to make the fullest use of the carrying capacity of the hired vehicles. In so doing, the Ministry does not, however, intend to compete unfairly with the commercial haulier or to prejudice unfairly the post-war position of the goods-carrying industry. This point will be carefully watched in collaboration with the Road Haulage Committee.

Post-War Reconstruction

The Minister without Portfolio has undertaken responsibility for the study of reconstruction and post-war problems. Later on, when the end of the war can be more clearly foreseen, a Ministry will be formed for this purpose. Meanwhile, Mr. Arthur Greenwood will be Chairman of the group of Ministers. The object will be to find practical solutions for the immediate problems of a transition from war to peace, and also to outline and presently to amplify a policy for the years immediately following the war, which will command the support of the nation as a whole.

Speeding Repair of Roads

Sir Warren Fisher, Special Commissioner in the London Region, has had under consideration the arrangements for speeding-up the work of repairing roads and public utility services damaged by enemy action.

The local authorities have been asked to submit proposals for strengthening their road repair organizations by securing additional men and equipment. Steps have been taken to secure the release from the Army of former employees of highway authorities and their contractors who used to be engaged on road work. Local authorities have also been advised to train unskilled men so that they can undertake skilled work.

Sir Warren Fisher attaches special importance to the necessity of re-opening the roads, or the parts of roads which have had to be closed for repair or because of the demolition and clearing of damaged buildings. He is calling for a report when any road is closed for more than a specified period.

The debris from houses which are being demolished is no longer to be placed on undamaged parts of the roads in front of the damaged buildings, save in exceptional cases.

Normally, buildings are to be demolished on to the site and the road kept open to avoid more than is necessary of the diversion of traffic.

War Damage to Roads

The Chancellor of the Exchequer has given notice of his intention to ask the House of Commons to insert in the War Damage Bill a new clause dealing with compensation for war damage to highways.

The clause proposes that where damage is done to public highways, or to bridges or viaducts carrying them, payments shall be made to highway authorities by the War Damage Commission in accordance with a scheme to be drawn up by the Treasury; and that contributions towards the expense of making such payments shall be made by county and county borough councils at such rates as may be provided by the scheme. The contributions will be payable in five annual instalments and will be in proportion to the rateable value of property in the area.

It is also proposed to give the Minister of Transport power to make grants to councils in respect of their contributions under this war damage scheme. Such grants, to be paid from the Road Fund, must not exceed one-half of the contributions payable by any council. The scheme to be operated under this new clause will be embodied in an order, which will not be effective until it has been approved by a resolution of the House of Commons.

There is also to be submitted to the House of Commons a money resolution by which the grants payable from the Road Fund to local authorities under the scheme are to be met from money provided by Parliament.

Defence Works

Worcestershire County Council Highways Committee reports receipt of a communication from the Secretary of the County Councils' Association with reference to the question of the payment which should be made to County Councils in respect of emergency defense works undertaken by them for military purposes, stating that negotiations had taken place between the Association and the War Office with the result that the War Office had adopted the Association's proposals in their entirety and that payment will now be made on the following basis, namely—

(i) The prime cost of labor and materials and charges for plant other than that mentioned in sub-paragraph (iii) below;

(ii) A sum apportioned to labor in respect of sickness and holiday pay, workmen's compensation, superannuation, etc.

(iii) A percentage addition of one and a half to the total of sub-paragraphs (i) and (ii) above to cover the use of small tools and plant (see paragraph 4 of Ministry of Transport Circular 516).

(iv) A percentage addition of four on the total of sub-paragraphs (i), (ii) and (iii) above to cover supervisory and administrative costs.

The Committee has expressed to the Association satisfaction with these arrangements.

Standardized Road Signs Should Not Be Scrapped

Some time ago the Director of Scrap Supplies communicated with highway authorities suggesting that there might be available a certain amount of scrap metal in some of the road signs which had been removed, and called for a schedule of signs from each area.

The impression appears to have arisen in the minds of some surveyors that the intention was to recover as scrap all signs, irrespective of their utility, that might be serviceable for such a purpose.

Enquiries have been made from the Ministry of Transport, and from the reply received it is perfectly clear that there is no intention whatever of recovering as scrap, signs which are of the standardized type conforming to Ministry of Transport standards.

It is known from enquiries received that some surveyors are not clear on this point, and they may be arranging, therefore, to include in the schedule signs which have been temporarily removed and which, obviously, will go back in normal times. If such signs are handed over as scrap, a great difficulty from the finance point of view can be anticipated in their replacement after the war.

Control of Coal Tar

The Secretary for Mines has signed the Control of Coal Tar Order, 1941, which came into force on February 1st last.

Under the Order the acquisition of crude coal tar by tar distillers is now controlled by license. The Secretary for Mines has power to make directions at any time instituting control by license of the disposal by tar distillers of any of the primary products of the distillation of crude tar. The Secretary for Mines may also make directions for controlling the price of coal tar and coal tar products.

Control of the coal tar distillation industry has been found necessary because of the great importance to our war effort of coal tar products. Benzole and toluene are not covered by the Order.

War-Time Road Repairs

In connection with the repair of private roads damaged through enemy action, the Middlesex County Council intimates that although the responsibility for the repair of private roads was primarily a matter for the owners, the Regional Commissioners had advised that where it was essential in the public interest that repairs

here are **3** reasons for using Asphalt

1 It's adaptable

—to every highway paving problem, new construction, resurfacing, widening, or stabilization.

2 It's economical

—because it's easy to lay, with simple equipment, and gives full salvage of existing roadway materials.

3 It's time-saving

—because local aggregates, labor and equipment are readily available.

2 It's economical

...because it's easy to use, with simple equipment and materials

● With few exceptions, most localities need the same road improvements for National Defense as for normal peace-time use. But, without exception, both call for building as many miles of adequate, all-weather roadways as possible with the money available.

When you mention *economical* highway improvement, you are talking about Asphalt. First, you can choose just the type of Asphalt construction that present roadway and traffic conditions require. Second, only low cost materials are needed, whether you are surfacing unimproved roads, resurfacing worn pavement or widening present roadways. Local aggregates, and much of the present roadway material may be utilized, and laid with simple equipment.

A Standard Oil Asphalt representative will gladly discuss these and other advantages of Asphalt construction as they might apply to your particular problems and local conditions. Just write Standard Oil (Indiana), 910 South Michigan Avenue, for the representative nearest you.

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Asphalt for every purpose

STANDARD OIL COMPANY (INDIANA)

to private roads should be carried out at once, and the owner was either unable or unwilling to undertake it, the local authority should arrange for the work to be done, and in that event the additional expenditure might be included in a claim for reimbursement.

In connection with road damage generally, the London Civil Defense Region has indicated the basis on which the additional expenditure to be reimbursed in connection with the repair of war damage to roads was to be calculated. It appeared that as regards repairs carried out by direct labor the wages of all the workmen employed on repairs at recognized trade union rates would be reimbursed, except in so far as the workmen were men whose wages formed a direct annual charge on local funds. Where repairs were carried out by contract, the work would normally be carried out on a prime cost plus profit basis, and the whole of the expenditure so incurred would be reimbursed provided that the prime cost contracts did not provide more favorable terms for the contractors than that provided in the model prime cost contract for emergency work issued by the Ministry of Home Security, or the work was carried out on a competitive basis. No claims for reimbursement would be allowed in respect of local authorities' establishment charges, whether the work was carried out by direct labor or contract, but the cost of reinforcing the local authorities' technical staff in order to secure expedition in completing repairs, etc., would be repaid. No change had been made in the financial arrangements relating to the cost of repairing damage to sewers in highways, the expenditure so incurred would not be repaid. The arrangements referred to would be retrospective to and including Oct. 25th, 1940.

Essential Maintenance

In presenting his estimates for the next financial year, Mr. E. H. Collcutt, the County Surveyor of Cornwall, warned the Highways Committee that the big reductions being made in road expenditure each year could not continue indefinitely without affecting the capital value of the county highways. Several other county surveyors have uttered similar warnings and there appears to be a very general feeling that the limit of economy has been reached. Although exact figures are not available it may be assumed that expenditure on road maintenance is some 10 to 15 per cent lower than in the period immediately preceding the war. Increased prices of plant, materials and labor have still further reduced the useful effect of this expenditure and it is probably true to say that the effective value of road maintenance is little more than two-thirds its pre-war value.

The main consideration is not the capital value of the roads after the war but their capacity to carry the enormously increased volume of traffic created by the failure of the railways to come up to expectations and by the resulting reversal of the Government's policy towards commercial road transport. Traffic on the roads is little, if any, less than its pre-war volume; the probability is that it will exceed this volume in the next few months as the war production drive gets into its stride. Before the war expenditure on road maintenance, as distinct from new construction, amounted to about two-thirds of the total road budget. If allowance is made for the reduced, though by no means inconsiderable, amount of essential new works still in progress, it can be seen that expenditure on road maintenance is already less than the pre-war level. It could hardly be claimed that pre-war expenditure was lavish; bearing in mind the prevailing policy towards road transport it is more likely to have been the bare minimum necessary to keep the roads in a tolerable state of repair. The prospect, therefore, is one of increased traffic and reduced maintenance. No wonder those responsible for the upkeep of highways are showing signs of anxiety.

Black-Out Precautions

Leeds Curb Lighting Trial.—The experiment of illuminating curb edges during the black-out is being tried in Leeds. The device has been installed at a pedestrian crossing at Woodhouse Moore, and it provides illumination from a cavity in a concrete block forming part of the curb. Councillor H. W. Sellers, O.B.E., a member of the Leeds Emergency Committee, whose idea it is, stated recently that the aim of the device was to light the curb side. It was an indirect light which could not be seen from the air, and had the further advantage of causing a reflection from the "cat's-eye" studs at pedestrian crossings. It could be used also, with a red glass covering, to indicate dangerous corners and crossings, and as a substitute for red lamps at present placed on curb edges. Mr. Sellers added that the device was intended as an addition to overhead "star lighting."

Traffic Experiment in Glasgow.—Traffic police in Glasgow are to be equipped with illuminated helmets to assist motorists in the black-out. The helmet will be white with a lighted sign reading "Police" on one side and "Stop" on the other. In addition the officers will carry red and green torches in order to give appropriate signals to traffic. Current for the illumination is supplied by an accumulator fitted on the belt.

Street Names on Road Surface.—To help people in the "black-out" the Borough Engineer of South Shields (Mr. A. G. Richardson is to experiment with street names "grooved" in paving blocks, with the letters painted black. Street names are often fixed too high to be read by dimmed torches, and in any case the "black-out" regulations forbid torches to be flashed upwards.

Lighting up the Black-out at Hammersmith.—All obstructions in roads or public highways at Hammersmith, London, W., are to be treated with luminous paint. The scheme has been approved by the Borough Council following the success of an experiment in painting several lamp-posts. It is hoped to extend the scheme by painting curbstones as well.

EROSION: THE FARMS' FIFTH COLUMN

The present cropland area of the United States is about 415 million acres. Of this area, according to the U. S. Soil Conservation Service, only about 342 million acres is classed as "good," the remainder being too steep, too rough, too shallow, or too infertile for profitable cultivation. The major portion of the "good" land is losing soil with every hard rain. Actually, we have only about 62 million acres now in crops that are both good and definitely safe from injurious erosion. By undertaking costly projects of irrigation, drainage, clearing, and the like we could develop another 68 million acres of good land comparatively safe from erosion.

Surveys by the Soil Conservation Service show that 282 million acres of crop and range land have been ruined or severely impoverished by erosion. Erosion is under way on an additional area of 775 million acres of crop, grazing and forest land. Altogether more than half the area of the United States and about 72 per cent of the good arable land (land now in cultivation or that can be brought under cultivation) is being impoverished by erosion.

In these days . . .

would you try a twist drill with 50% longer life?

Surely in these critical days you would try a different drill if you could be sure it would last 25% or even 10% longer. And you would apply the same logic to wire rope if you knew that there is really a difference in ropes. There is, and the name of the rope to ask for is

HAZARD LAY-SET *Preformed*

In comparison with non-preformed ropes, LAY-SET Preformed often makes astonishing records.

In the first place, it *lasts longer* because of its extreme resistance to fatigue. That eliminates frequent shutdowns for replacement, thus saving priceless time. This means faster and more consistent production.

In the second place, it is *easier and safer for workmen* to handle. It is disinclined to kink. It's relaxed and tractable like a well-trained saddle horse as compared with a bucking bronco.

These characteristics are preformed into LAY-SET Wire Rope at the mill, and they account for its ability to withstand hard work for a longer time at a lower cost—and with greater safety to men and equipment.

See for yourself by ordering Hazard LAY-SET Preformed Green Strand and keeping a comparative record of its performance. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

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FLOATING A 150-IN. MULTIPLATE CULVERT BACK INTO PLACE

IN THE process of modern high speed construction various problems arise which require a new line of thought to solve. Such an instance occurred in June, of 1939 while installing and backfilling a 150 in. multiplate culvert on Federal Aid Project 127-B, Diversion Dam—Dubois Highway in Fremont County, Wyoming.

Fig. 1

This pipe was installed and strutted according to the Wyoming Highway Department specifications in Cottonwood Creek, which normally carries a very small stream but in addition carries the overflow and spill from an irrigation ditch about 1½ miles up stream. Backfilling and mechanical tamping were progressing very slowly and when this was completed to within 18 in. of the spring line a break developed in the irrigation canal which necessitated opening the spillway letting a considerable head of water down the creek. Water in the pipe was about the same elevation as the backfill. The struts caused a noticeable resistance to the water and all tamping done to date had more of a tendency to lift the pipe than to hold it down. The pipe seemed to "breathe" then roll slightly, then in a few minutes it raised and floated out. This happened about 10:00 P. M. while the backfilling and tamping were in progress; in fact under the flood lights the whole thing was somewhat spooky. The pipe washed downstream 23 feet where its end hit a slight bend in the channel where it stopped. During the floating the pipe turned on its longitudinal axis about 5 degrees as can be seen in

Fig. 2

Fig. 3

Figs. 1 and 2 (looking downstream and upstream respectively).

Various means were discussed as to getting the pipe back in position. Finally it was decided to float it back. The location was carefully restaked as to line, then the

Fig. 4

process of building bulkheads in the ends of the pipe from sand bags was started (see Fig. 3). When these were completed a dam was quickly built about 25 ft. down stream with a D8 tractor and dozer. In the meantime a head of water had been turned down the creek

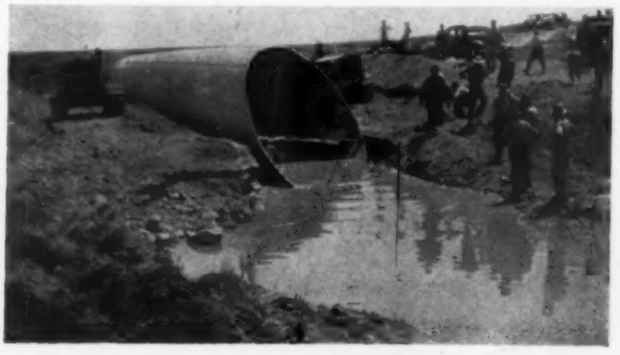

Fig. 5

AMERICA SWINGS INTO ACTION

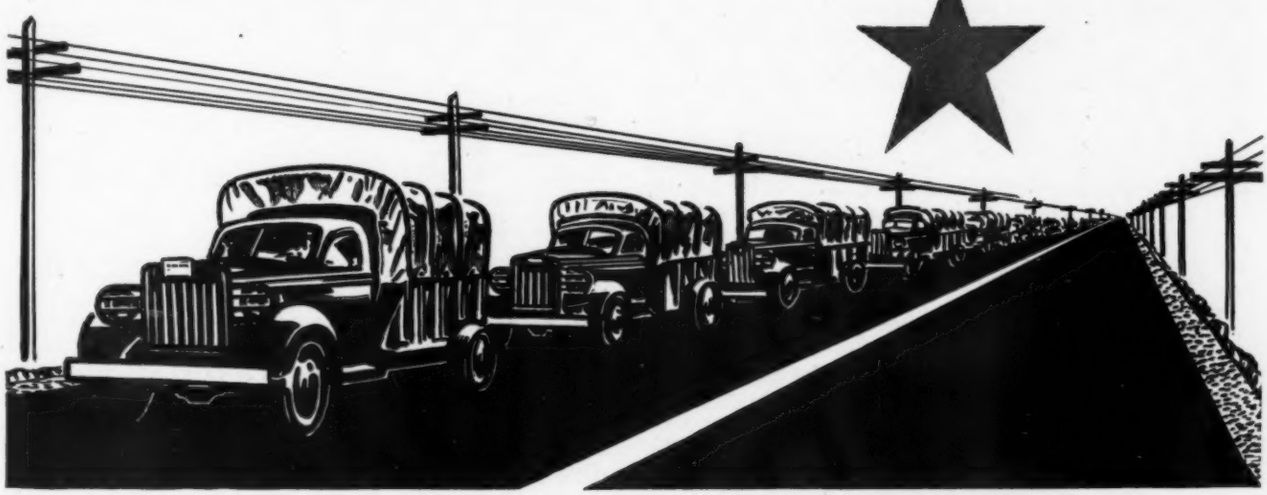

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Fig. 6

from the irrigation canal to give the necessary amount of water. As the water raised there was some seepage through the bulkheads and joints but this was taken care of by a 3 in. centrifugal pump as shown in Fig. 4.

When the pipe was drawing approximately 2 ft. of water it floated. A D8 tractor was hitched to each side of the pipe as shown in Fig. 5 and at a given signal both tractors started forward. There was no evidence of any stress or strain in the pipe at any time. The iron rod sticking out of the water in Fig. 5 was the staked point for the end of the pipe. After the pipe was in place both tractors were placed on one side with cable hitches over the top of the pipe and fastened into the next to the bottom plate as shown in Fig. 5. It was then rolled or turned in the water until the struts were again perpendicular. The dam was then removed and the pipe allowed to settle to its correct position.

While the pipe had the correct position the footing was anything but satisfactory, so some means was necessary to get under the pipe to allow reshaping. First, cross-struts were placed in the pipe at right angles to the original struts (Fig. 6); next the backfill that had been placed was removed and a by pass made for the normal flow of water; next the two tractors were hitched as shown in Fig. 6, and at a given signal both tractors started and gently rolled the pipe through one-fourth its circumference as shown in Fig. 7. Reshaping the base to template was then done, the pipe rolled back into place in the same manner it was rolled out, backfilled, tamped and the roadway completed without further trouble.

In short, water from an irrigation canal carried out the pipe and water from the same ditch carried it back.

Gibbons & Read, Salt Lake City, Utah, were the contractors. The Thompson Manufacturing Co., Denver, Colo., furnished the plates.

Fig. 7

The foregoing is taken from a report by Ross A. Stapp, Project Engineer in charge, for which we are indebted to Chas. E. Gard, Resident Engineer, Wyoming State Highway Department.

NEW TESTS FOR CONCRETE AND CONCRETE AGGREGATES

As a result of the meetings of Committee C-9 on Concrete and Concrete Aggregates held during American Society for Testing Materials Committee Week, March 3 to 7, in Washington, four important new tests and specifications are to be offered to the society at its annual meeting in June in Chicago for publication and approval as tentative standards. The three test methods for which there has been definite demand will cover the sampling of wet concrete, methods of determining volume of air entrained in concrete, and standardized procedures for determining the thickness of cores drilled from a concrete structure.

The proposed new tentative specifications for ready-mixed concrete which if accepted will comprise a tentative revision of the existing standard covering this material, C 94, include a number of improvements brought about in part by progress in this industry, and increasing demands for the material. In proposing the new requirements, Committee C-9 felt it desirable to keep the present standard in effect for the time being.

Other recommendations which will be offered involve revisions in the following tests and specifications:

Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (C 88-39 T).

Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine (C 131-39).

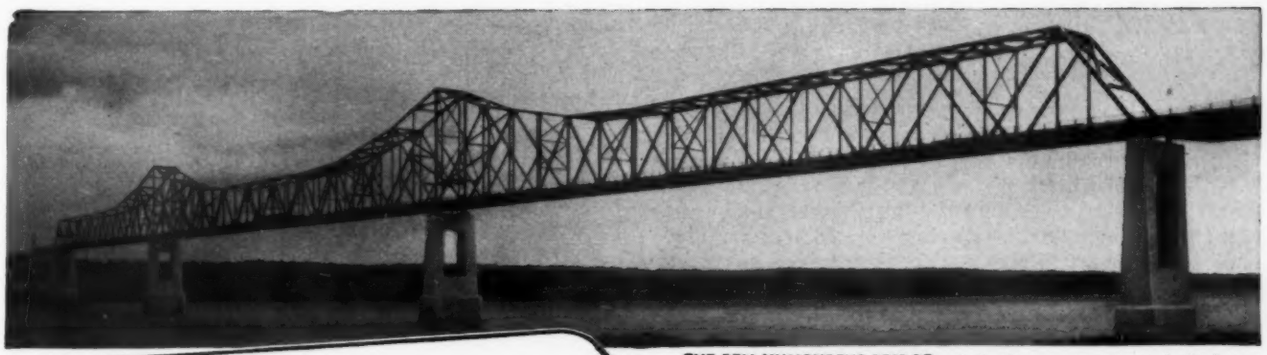
Specifications for Lightweight Aggregates for Concrete (C 130-39).

The officers of Committee C-9 are: Chairman, F. H. Jackson, Senior Engineer of Tests, Public Roads Administration, Federal Works Agency, Washington, D. C.; Secretary, R. R. Litehiser, Chief Engineer, Bureau of Tests, Ohio State Highway Testing Laboratory, Ohio State University, Columbus, O.

Minnesota Patrol Covered 435,000 Miles of Highway.—Members of the Minnesota State Highway Patrol during February patrolled more than 435,000 miles on state trunk highways in approximately 24,000 hours of duty, as compared to 274,000 miles patrolled during 26,000 hours of duty during the same month of 1940. As a result of the increased patrol activity on the highways, 5,439 traffic law violations, most of them dangerous to life and property, were intercepted as compared to 2,018 during February of 1940. At the same time 2,925 motorists in trouble on the road were given aid by patrolmen, as compared to 2,548 in February a year ago.

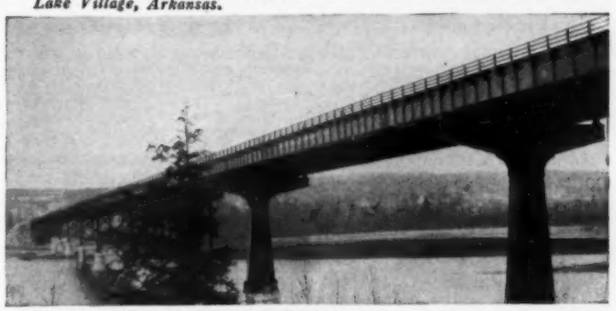
Roads and the Army.—A camp for training 40,000 mechanized troops needs over 50 miles of roads of the first order. An armored division, if the whole of it goes out, takes 100 miles of road to get into column.

Asphalt Tonnage at New High.—At the annual meeting of March 12 of the board of directors of The Asphalt Institute it was announced that figures for 1940 showed asphalt consumption at 6,580,400 tons, 6 per cent above the previous high record made in 1939.

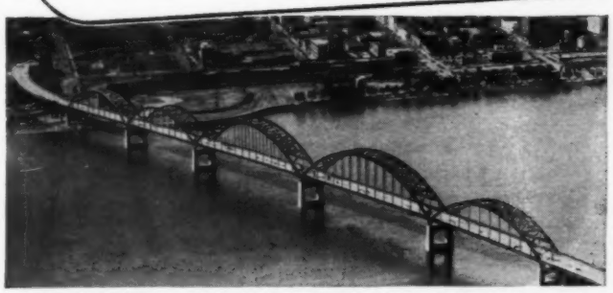


THE BEN HUMPHREYS BRIDGE. *A 2-mile structure, comprised of a 2121-foot cantilever crossing of the Mississippi River flanked by deck plate-girder approaches on curve and grade, carrying the 24-foot concrete roadway of U. S. Highway No. 82 between Greenville, Miss., and Lake Village, Arkansas.*

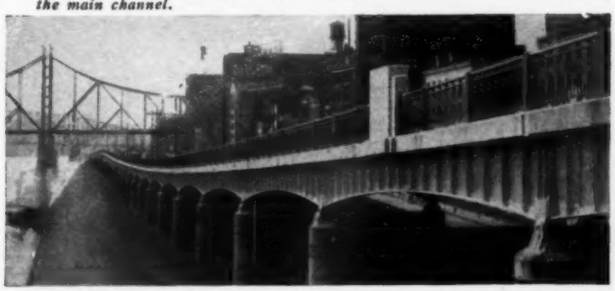
Notable structures in Steel mark 1940's highway development



WILBUR CROSS PARKWAY BRIDGE. *Typical of modern trend to continuous and cantilever plate-girder design, this 1284-foot bridge carries two 26-foot separated roadways of open-type I-Beam-Lok over the Housatonic River near Milford, Conn. Two unique T-type steel bents, anchored to single cylindrical piers, support the cantilever unit over the main channel.*



THE CENTENNIAL. *Distinctive as the first tied-arch river crossing of the Mississippi, the total length of this bridge, including deck plate-girder approaches, is 3851 feet. It carries two 22-foot separated concrete roadways which directly connect the business centers of Rock Island, Illinois, and Davenport, Iowa.*



WATER STREET PROJECT. *Part of the Water Street Reconstruction in Pittsburgh, Pa., for traffic segregation on paralleling roads, this 2300-foot viaduct skirts the Monongahela River and carries the 30-foot eastbound-traffic roadway. Supporting girders, of pleasing appearance, are combined cantilever and suspended units with curved bottom flanges.*

ENGINEERING skill achieved notable results in 1940 in the increasing development of the nation's highways. More than ever, the versatility and adaptability of steel construction was demonstrated as the solution for difficult problems in river crossings, elevated speedways, highway overpasses and ramps.

Steel construction, which has long since demonstrated its sturdiness and reliability, has met, too, the increasing challenge for impressive beauty. Countless graceful structures point to the fact that there is no need to sacrifice the aesthetic for strength. Steel has proved how efficiently and economically it can be engineered in harmony with its environment.

In this modern trend American Bridge Company has had the good fortune to play an increasingly important part. Doubtless we owe that to the long acquaintance engineers and contractors have had with our work on all types of steel structures, with our engineering personnel and facilities, our half century of experience.

While we have yet to find the fabrication and erection job too big or too difficult to undertake, we take particular pride in the fact that the smallest job, too, is given the full benefit of the best we have in skill and experience.

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UNITED STATES STEEL

STABILIZED BASE MATERIALS MIXED IN MIXER

A PROJECT now nearing completion on a section of U. S. 99 extending from Beaumont to Banning, Calif., provides for the construction of two new traffic lanes, 6.12 miles in length, adjacent to the existing 2-lane paved road, thus providing a 4-lane highway. The new construction includes the placing of a cement stabilized base and topping the base with plant-mixed surfacing. The following information on the base construction is taken from California Highways and Public Works.

The cement stabilized base consists of selected material, portland cement and water each in proportioned amounts mixed in a mixing plant, and placed on the roadbed, compacted and cured.

The selected material was excavated from the middle fork of San Timoteo Creek and mixed in the contractor's plant at the same location. The plant was an all steel portable type using a 2-yard capacity single shaft mixer.

Material was hauled from the creek bed with RD-8 tractors and carryall scrapers and dumper over a trap and by automatic feed was conducted to an elevating bucket line. It was screened by vibrating screens into bins from where it was drawn into the batch box and weighed by multi-beam scales. The minimum mixing time was 45 seconds.

At first, 1½-yd. batches were mixed. This was increased to the mixer's capacity of 2 yd.

As a point of economy, the grading specifications were made to conform closely to the screen analysis for this pit and the waste was negligible. Approximately 90 per cent of the pit material passed the 4-mesh screen. The job was started using cement at the rate of 6 per cent of the base material by weight. This was later increased to 7 per cent.

Approximately 10 per cent to 11 per cent of water was required in the mix. This particular material was quite critical and necessitated close control.

The mixture was hauled to the street in dump trucks and placing was commenced at the point farthest from the plant.

Experiments in Methods

As the procedure of handling this type of base was new to contractor and engineers, considerable experimenting in methods of placing and compacting was done in order to obtain the best results.

Standard asphalt pavement spreader boxes were first tried in spreading the base material on the street. The required compacted thickness ranged from 6 to 9 in. Due to a very high bulking property of this mixture, it was necessary to spread a thickness of approximately 14 in. to obtain a compacted thickness of 9 in. This required cutting an extra large outlet opening in the spreader box. Due to lack of sufficient rigidity in the box and difficulty in keeping the spreader box ends filled, it did not give a uniform spread.

As a trial method material was truck-dumped on the street and spread with a bulldozer. This also proved to be unsatisfactory.

Special Bulldozer Blade

After exhausting various methods for spreading the material, a bulldozer blade was equipped with steel wings extending forward about 4 ft. from the ends of the blade. The forward ends of the wings were mounted on wheels and adjusted for elevation above grade. This worked quite well except that the mixture on being dumped from the truck, was partly consolidated by virtue of its mass, at the center and less consolidated near the ends of the blade. This resulted in a crown section after rolling.

To eliminate the crown in the finished base, adjustable steel plates were placed along the bottom of the bulldozer blade, and set to give a section that after compaction would be even and of the required thickness.

Trucks while dumping were pushed by the bulldozer and as much mix as possible was kept in front of the blade at all times. Some hand shoveling was necessary to keep the proper amount near the ends of the blade.

Spreading and Compaction

Spreading was accomplished one-half width at a time. Single spreads were advanced up to 50 or 75 ft.; the other half was then brought up.

Compaction operations were first tried by using a sheepsfoot tamping roller, but due to the high per cent of fine material in the mix, the feet of the roller tore up the material to such an extent that it was unsatisfactory.

Compaction was accomplished by using a 12-ton, 3-wheel roller behind the spreader. This was followed by shaping with a motor grader having a 12-ft. blade.

A 1600-gal. tank truck was used to apply a fine spray of water through a 12-ft. spray bar, as necessary, to keep the exposed surface from becoming dry.

Tandem and 3-wheel rollers used for finish rolling caused surface laminations and were eliminated from this operation. This was overcome by truck rolling, using pneumatic tires and a slight excess of moisture on the surface.

When laminations could not be eliminated by rolling, the high parts were cut off with a motor grader and wasted.

Curing Seal Applied

Immediately behind the final rolling, an application of approximately ⅛-gal. per square yard of Liquid Asphalt RC-1 was applied, as a curing seal, using a power spray and hand operated nozzle.

At the beginning, the time cycle required in handling the mixture from the mixing plant to the finish rolling on the street was about three hours. As equipment and handling technique were developed, this was reduced to about 1¾ hours.

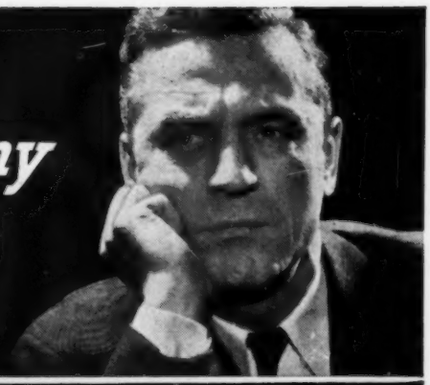
Recent experience on other projects shows that individual characteristics develop for different jobs regarding compressive strength, water control, and bulking when spread on street and difficulties encountered in consolidating and compacting.

The work is being done by Oswald Brothers, contractors. J. M. Hollister is the resident engineer.

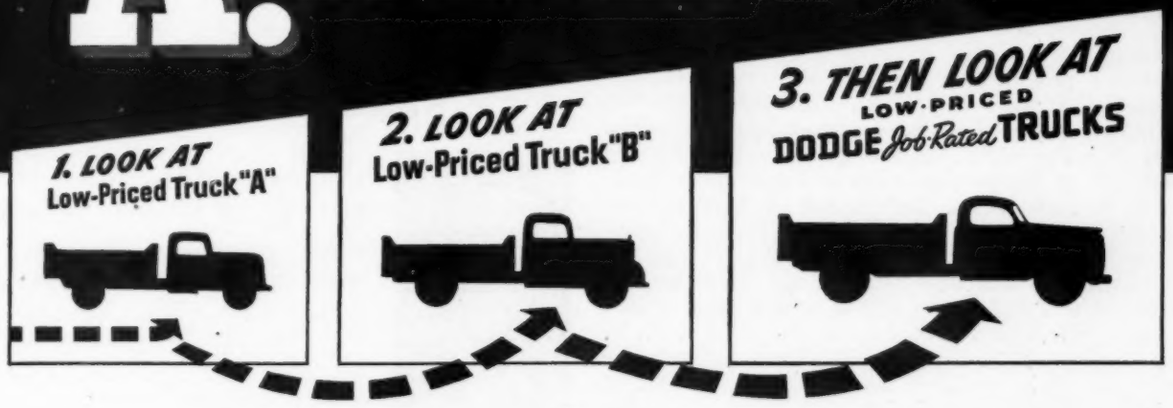
▼

New List of American Standards Available.—The American Standards Association has published a new list of American Standards for 1941. More than 400 American standards are listed, covering definitions, technical terms, specifications for metals and other materials, methods of test for the finished product, dimensions, safety provisions for use of machinery, and methods of work. They reach into every important engineering field and serve as a basis for many municipal, state, and federal regulations. The list will be sent free of charge to anyone interested in the work. Requests should be addressed to the American Standards Association, 29 West 39th St., New York, N. Y.

Q. How can I cut my hauling costs?



A. Look and Save! Buy the One-Two-Three Way...



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SOME NEW STATE HIGHWAY OFFICIALS

E. T. Gawkins: New York

E. T. Gawkins

E. T. Gawkins the new assistant commissioner in charge of construction of the Division of Highways of the New York State Department of Public Works, was born in Rome, N. Y., and originally joined the State Service in 1910, when he was appointed on the engineering staff of the state engineer and surveyor, with headquarters at Rome, and worked on the construction of the Barge Canal.

He was first assigned to the Water Supply Department which provided for the construction of dam and feeders for the water supply for the Barge Canal. In 1913 he was assigned to the construction on the canal proper at Rome, N. Y. In the spring of 1915 he was transferred to Barge Canal construction, with headquarters at Amsterdam. In the fall of 1915 he was transferred to the Division of Highways, with headquarters at Utica. He worked out of this office on highway construction and design until 1926, when he was transferred to Long Island which, at that time, was a residency under the supervision of District No. 8. In 1930, Long Island and greater New York were made District No. 10 of the New York State Department of Public Works. His first duties, while in this District, were those of chief draftsman. He was afterwards appointed as assistant district engineer and held this position until March 1, 1940, when he received his appointment as Assistant Commissioner of Highways, with headquarters at Albany, N. Y.

Walter A. Rosenfield: Illinois

W. A. Rosenfield

Walter A. Rosenfield, the new director of the Illinois State Department of Public Works and Buildings, is a native Illinoisan. He was born 62 years ago in Rock Island and has lived his entire life in that city, where for many years he has been prominent in business, industrial and civic affairs.

Formerly head of the Moline Wagon Co., Mr. Rosenfield left that concern in 1911 when it was sold to the Deere Co. Since then he has developed several manufacturing enterprises in the management of which he continues to take an active part. Twice elected mayor of Rock Island, he held that office from 1923 to 1927, and for three years, 1936 to 1939, was president of the Rock Island Chamber of Commerce. He was a member of the Republican State Committee for a number of years, serving at one time as its chairman.

A member of the Illinois National Guard for sixteen years Mr. Rosenfield held the rank of major during the World War. He was in charge of the manufacture of vehicular military equipment.

Mr. Rosenfield is married and has two children, a son, Walter Jr., and a daughter, Phyllis. Young Rosenfield resigned his position recently and went to England where he is now a civilian instructor in flying.

Fraternal organizations to which Mr. Rosenfield belongs include the Masons and the Elks.

Mr. Rosenfield's appointment to be Director of Public Works and Buildings was among the first made by Governor Dwight H. Green. It became effective on Jan. 20, 1941.

Wardner G. Scott: Nebraska

W. G. Scott

With the inauguration of the republican administration, Wardner G. Scott, 44-year-old Lincoln engineer, succeeded State Engineer A. C. Tilley as head of the department of roads and irrigation. As state engineer, he also heads not only the highway department and irrigation bureau, but also became titular director of the state highway safety patrol and the planning board.

Wardner G. Scott is the son of the late Winfield Scott, founder of the firm of Scott & Scott and former Lancaster county engineer. He was born in Lincoln Sept. 2, 1896. He was graduated from Lincoln high school and attended the University of Nebraska. With the exception of 3½ years, he has spent his entire life in Lincoln and since the death of his father in 1934 has headed the Scott & Scott engineering firm.

In 1917 he accepted a position with the Interstate Commerce Commission's bureau of valuations at Kansas City, Mo., and about 18 months later joined the division engineering staff of the Los Angeles and Salt Lake Railroad at Salt Lake City. The railroad has since become a part of the Union Pacific.

Returning to Lincoln in 1920, Scott entered into partnership with his father and has remained with the firm which has specialized in municipal improvement work, paving, drainage, water supply, sanitary sewers and sewage treatment. For 13 years he has been chief engineer for Lancaster county Sanitary District No. 1, a project responsible for the drainage of the Salt Creek valley. During the intervening years, his firm handled improvement projects for some 40 municipalities. Much of this work in recent years, has been in conjunction with federal work agencies. One of the most recent jobs of the firm has been that of advisory engineers for construction and operation of the new water supply system at Falls City.

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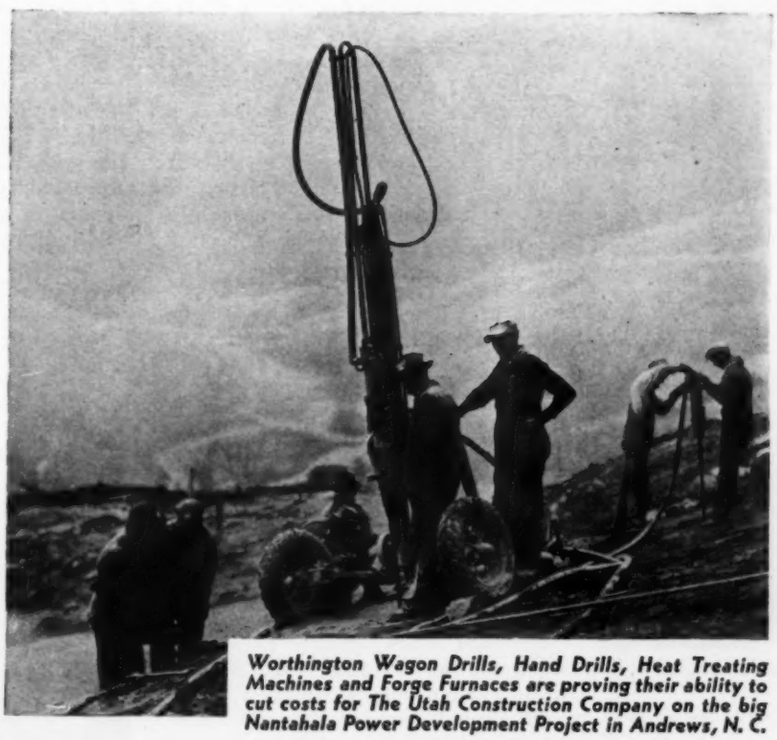

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Mr. Scott is married and has one daughter, Miss Shirley, a sophomore in the University of Nebraska. He is a member of the American Society of Civil Engineers and the Nebraska Engineering Society. Last year he was president of the Lincoln Country club.

Earl B. Lockridge: Indiana

E. B. Lockridge

Earl B. Lockridge, the new chief engineer of the state highway commission of Indiana, received his college training at Indiana State University. Shortly after graduating he became county surveyor of Miami County, Indiana, serving in this position for three terms. Following his work as county surveyor he became city civil engineer of the city of Peru, Ind., which position he held until May 13, 1917, when he resigned to enter First Officers' Training Camp. He was commissioned a captain of engineers at Fort Leavenworth on Aug. 15, 1917, and served slightly over two years with the U. S. Army, participating in the Meuse-Argonne Offensive. He retained his commission in the Army as a reserve officer, first as a major and now as a lieutenant-colonel of engineers.

He began working for the state highway commission of Indiana on Sept. 9, 1919, for a short time in the bridge department, then as district engineer of maintenance until 1933 when he became field engineer of maintenance, and in 1937 he became assistant chief engineer and engineer of construction, which position he continued to hold until December, 1940, when he was made chief engineer. He is at this time chairman of the advisory board of the joint highway research project conducted by the Engineering Experiment Station of Purdue University in cooperation with the state highway commission of Indiana, of which he has been a member since 1937.

Warren R. Neel: Georgia

W. R. Neel

Warren R. Neel slipped into a familiar harness when for the second time in his career he was appointed state highway engineer of Georgia. In 1917 at the time of the organization of the Georgia Highway Department Mr. Neel was made engineer and secretary and treasurer of the highway commission. A year later the department was reorganized and he became chief eengineer. In this capacity he continued for 12 years until 1930 when he resigned to accept the directorate of Asphalt Service Inc. Mr. Neel made his initial return to the highway department as director of the newly created post roads division in 1937.

Foreign lands gave this native Georgian his first practical experience in engineering. In 1901 he left the Georgia School of Technology to accept employment in a professional capacity with the Mexican National Railways. After a year he went to Chiapas to aid in construction of the Pan American Railroad which runs from Isthmus of Tehuantepec to the Guatemala frontier.

In 1903 Mr. Neel returned to Mexico City and with the exception of one year when he acted as head of the construction department of the Mexico Light & Power Co. he engaged exclusively in private engineering and contracting until 1916.

At that time, due to the continued state of revolution in Mexico, Mr. Neel returned to the states and in January of the following year went to work for the newly created highway department of Georgia.

J. Stanley Williamson: South Carolina

J. S. Williamson

At a special meeting of the South Carolina State Highway Commission in December J. Stanley Williamson was elected Chief Highway Commissioner to fill the vacancy created by the death of Ben M. Sawyer. Mr. Williamson had been state highway engineer since July 1935.

Mr. Williamson has been connected with the State Highway Department since 1922. He was first employed as resident engineer on highway construction work and he worked his way up through the engineering organization to state highway engineer in 1935, which position he held until elected chief highway commissioner.

Mr. Williamson is widely known throughout the field of highway department administrators. He is at present president of the American Association of State Highway Officials and he has been active in the affairs of the association until 1935, having been a member of the executive committee for several years.

Mr. Williamson is a native South Carolinian, born and reared on a farm in Lancaster County. He was graduated from Clemson A. & M. College in 1916 with the degree of B. S. in C. E. He received his C. E. degree from Clemson College in 1937. For about three years immediately after graduation in 1916 he was employed by the Southern Power Co. (now Duke Power Co.) in the construction of hydro-electric plants.

During the last world war he served about ten months in the U. S. Army Engineers as second lieutenant.

Claude R. McMillan: South Carolina

C. R. McMillan

Claude R. McMillan was elected state highway engineer of the South Carolina State Highway Department, succeeding J. Stanley Williamson who was elevated to the position of chief highway commissioner.

Mr. McMillan is a native South Carolinian. He was born at Mullins, S. C., and received his civil engineering degree from the University of South Carolina in 1922. After working for the Southern Bell Telephone & Telegraph Co. for less than a year he went with the state highway department in 1923 as an engineering clerk in the Columbia office. Mr. McMillan's rise from an engineering clerk in 1923 to the post of chief highway engineer of the Department in 1941 was step by step. Between 1923 and 1930 he held the positions of inspector, resident engineer, chief of location party and maintenance supervisor. In 1928 he was promoted to assistant district engineer of the central

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CLIPPER MODEL 50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shovel No. 4	No	Yes	No	No	No	Yes	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Shovel No. 5	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes	No	No	Yes
Shovel No. 6	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 7	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 8	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 9	No	No	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 10	No	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 11	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Shovel No. 12	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No	Yes

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*Name Reg. U.S. Pat. Off.

district of the department and in 1931 was promoted to district engineer. He held the position of central district engineer with headquarters at Columbia, from 1931 to 1941 when elected state highway engineer.

Mr. McMillan being a typical "career" man, he is thoroughly familiar with all detail problems of the state highway department. He gained his knowledge of the affairs of the highway department through having actually done the work himself and he knows the practical application of highway engineering. As district engineer for ten years, he demonstrated his ability as an administrator and his selection as state highway engineer was widely approved by contractors and the general public as a wise choice.

▼

Jas. A. Davis: Washington

J. A. Davis

Jas. A. Davis, acting director of highways of the state of Washington, was appointed to this position on Sept. 16, 1940. Mr. Davis is a native of the state of Washington and was educated in Washington schools, receiving the degree of Bachelor of Science in Civil Engineering at Washington State College in 1909. During the past 32 years he has followed engineering and contracting work, having been engaged in municipal, railway, hydraulic and highway engineering as well as highway, railway and bridge contracting. However, the major portion of this time, or a total of 22 years, has been with the highway department of the state of Washington. Starting with the department in 1913, he has served in various capacities from that of draftsman through different classifications of resident engineer, district engineer, construction engineer, assistant highway commissioner, chief engineer, assistant director of highways to the position of acting director of highways, his present assignment.

▼

ENGINEERS NEEDED FOR NATIONAL DEFENSE PROGRAM

On April 7, the U. S. Civil Service Commission announced a new examination for engineering positions in the Federal Government. Engineers making application for jobs, except those applying in chemistry, metallurgy, marine or naval architecture which are covered by other announcements, should now apply under the modified terms of the new announcement. However, persons who have been rated eligible under the examinations announced in 1940 for mechanical, aeronautical, civil, or general engineer need not file new applications. They will be placed on the list of persons eligible for appointment as the result of the new examination.

The positions pay from $2,600 to $5,600 a year. Applications will be rated as they are received at the Commission's Washington Office until June 30, 1942. Egineers qualified in the following specialized fields are particularly needed for the National Defense Program and are urged to file their applications at once: Aeronautical, agricultural (farm machinery), construction (airports and buildings), heating and ventilating, mechanical (industrial production and diesel design), ordnance, radio, safety, sanitary (especially public health), structural (building design), and welding.

The duties of these positions will include design, construction, and research in the various branches of engineering. To qualify for the examination, applicants must have completed a 4-year college course in engineering and have had broad and progressive engineering experience. In general, this experience should have been of a kind which required thorough knowledge of mathematics, economics, and the physical sciences. Under certain conditions additional engineering experience may be substituted for all or part of the education, and approved graduate study may be used for the experience requirement. The maximum age limit is 60 years.

Further information and application forms may be obtained at any first- or second-class post office or from the Civil Service Commission, Washington, D. C.

▼

Indiana Roadside Planting Started.—Seventy-five miles of roadside planting and erosion control projects along Indiana state highways have been approved for this spring and work is now getting under way. These projects are a continuation of a program which was inaugurated seven years ago and which has resulted in the improvement of more than 1200 miles of state highways by plantings of trees and shrubs, seeding of shoulders, cuts and fills, and special plantings for erosion control.

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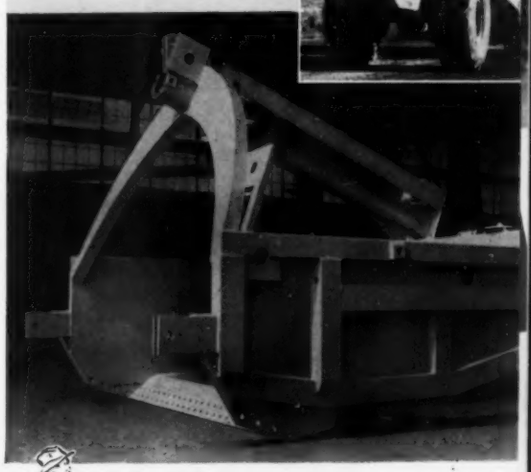

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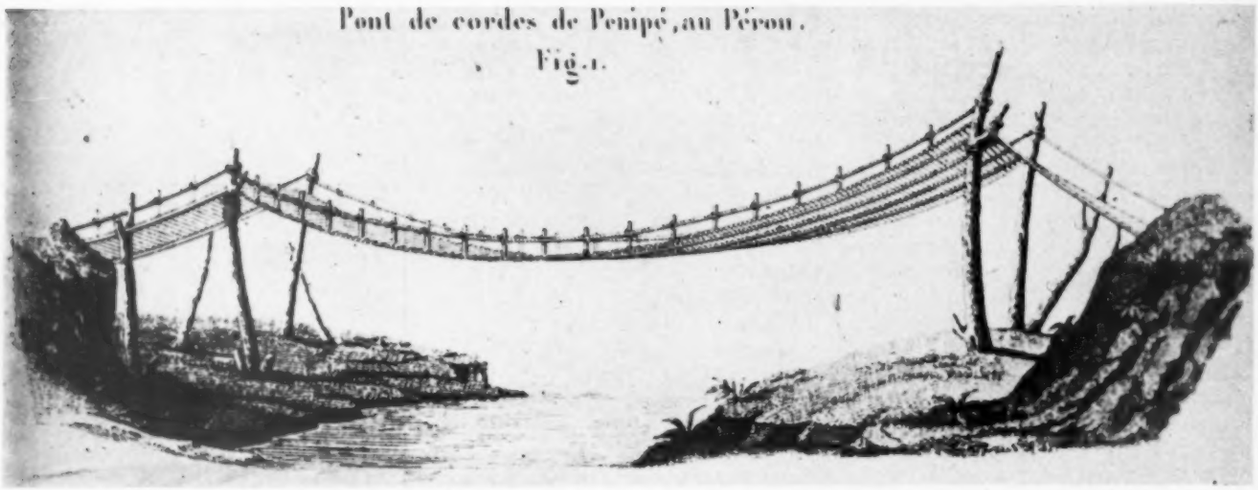

Fig. 1.—Primitive Suspension Bridge Discovered in South America in 1802. From "Memoire sur les Ponts Suspendue" by C. L. M. H. Navier (Paris, 1830).

Stiffness as a Factor IN LONG SPAN SUSPENSION BRIDGE DESIGN

By JAMES H. CISSEL
Professor of Structural Engineering, University of Michigan

THE suspension type of construction has been employed for bridge purposes since earliest times. The use of woven twigs or fiber to form cables crossing streams or chasms is of unquestionable prehistoric origin and the use of metal for bridges probably had its origin in suspension bridge construction, since iron chain bridges of the suspension type are known to have existed in China before the dawn of the Christian era. The first use of steel in bridge construction is reported to have been for the eye-bar chain cables of the Danube Canal Bridge built in Austria in 1828. Since the beginning it has been recognized that the suspension type lent itself most suitably to long span construction and some of the crude chain structures built more than 2000 years ago are reported to have had spans of 200 feet or more.

The first major advance in the design of this type of bridge is credited to the American, James Finley, who developed the idea of suspending the bridge floor from the cables and who was given one of the early United States patents for his design. In 1796, Finley built the first suspension bridge in America, a span of 70 ft., over Jacobs Creek between Uniontown and Greensburg in Pennsylvania. The Merrimac River bridge (see Eng. Rec., Vol. 42, Oct. 6, 1900; also Eng. News, Vol. 70, Sept. 25, 1913) built by Finley in 1810 with a span of 244 ft. between towers remained in use until 1909. The floors of earlier suspension bridges were placed directly on the cables thus entailing steep gradients over the towers and an altogether unsatisfactory floor arrangement except for limited traffic on comparatively short spans of tremendous magnitude. This marked the beginvided a level roadway thus extending the utility of such structures and paving the way to the construction of spans of tremendous magnitude. This marked the beginning of an era in suspension bridge construction which has extended up to the present time. Improvements in material, and methods of construction followed at a rapid rate. Wire was used to form the cables in about the year 1816; in 1831 the French engineer, Vicat, described his method of building wire cables in place, substantially the same method as is in use today; anchorages were made substantial; and in recent years, flexible steel towers replaced the massive masonry constructions formerly used. Contemporaneous with improvements in materials and methods of construction came refinements in methods of analysis and calculation.

Bridges of the type preceding the advent of the Finley patent, where the floor was placed directly on the chain cables, (Fig. 1) offered no serious problem as regarded analysis of stress for static loads. The mathematics of the curved chain was well known and it was a comparatively simple matter to determine the requisite strength for known forces. Such structures were of course extremely flexible and concentrated loads produced local changes in gradient for which no solution could be provided. The major problem, which defied satisfactory solution, was that of preventing undulations caused by the wind and many of these early bridges failed in this manner. The common method of resisting such undulations was that of fastening guys or stays to the cable and anchoring these to the sides of the chasm (Figs. 2 and 3) or to the abutments. It is of interest to note that substantially this same method has been recently employed in an attempt to prevent wind oscillation in the

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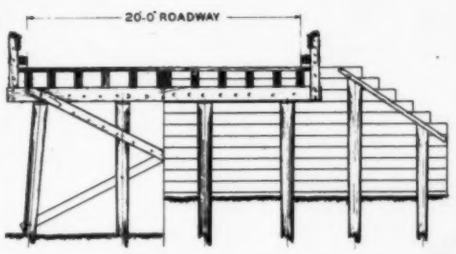

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TELLS HOW COAL TAR PITCH GIVE LONGER SERVICE

bridges constructed at Deer Isle and Thousand Islands (see Engr. News-Rec., Dec. 5, 1940). Structures of this type were, in early times, frequently used for military purposes and many such structures failed under the effect of dynamic forces created by marching troops. The idea for marching troops to break step when crossing a bridge probably originated as a result of the use of such bridges for military purposes.

The suspended floor arrangement introduced a new element in the design of suspension bridges in that the floor, which was essentially separate from the cables, could be made comparatively stiff and resistant to change in form as an independent structure. In fact, one of the features upon which Finley placed great stress was the arrangement for distributing concentrated load over a great extent of the bridge, thereby aiding to divide it over many suspenders and to stiffen the otherwise movable floor against change in shape.

Further emphasis was given to this principle by the French Engineer, Seguin, who stated in his book on wire bridges published in 1824:

> "One of the greatest inconveniences of suspension bridges are the vacillations arising from moving loads of any considerable masses. To prevent these, there should be employed all possible means affording rigidity; the very best of all existing of which I know is the arrangement of strong trusses as parapets of the bridges."

Where, however, a floor system having definite rigidity is combined with a relatively flexible cable the determination of stresses due to static loads involves consideration of the elastic behavior and relative stiffness of the component parts as well as the statics of the forces involved. As a result of this development, therefore, the precise solution of stresses in the cables and in the members of the stiffening system became somewhat involved and a vast amount of attention has been devoted to this problem during the past hundred years. Research and study has, however, produced well established theory and methods by means of which it is possible to determine with great precision the distribution of known static loads.

It is interesting to note that the effect of stiffness in the floor system was recognized at an early date as important in resisting undulations induced by wind forces and moving loads. The resistance furnished for such purposes was obtained as a by-product, however, and

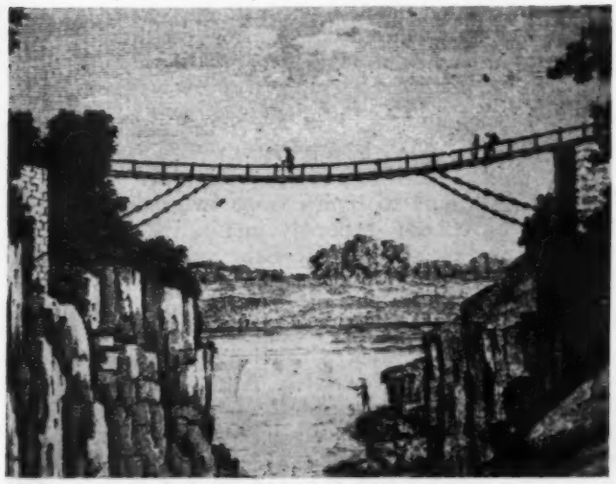

Fig. 2.—Winch Bridge Over the Tees River in England. First Suspension Bridge Built in England. Built in 1741; *Span 70 Ft.; Width 2 Ft.*

Fig. 3.—Wire Cable Suspension Bridge. Built in 1823 *at Geneva, Switzerland*

not achieved by direct or intentional design. One of the early suspension bridge failures resulting from wind action with reference to which there is authentic record was that of the Brighton Chain Pier (England) which failed in a gale on November 30, 1836. In an account written by Lt. Col. Reid and published in Vol. 1 of the Professional Papers of the Corps of Royal Engineers (Great Britain) it is stated:

> "At last the railing on the east side was seen to be breaking away, falling into the sea; and immediately the undulations increased."
>
> "Had the roadway been stiffened, either by a good trussed railing, or otherwise, it probably would have withstood this storm. From its oscillating sideways as well as undulating along its length, it seems to require stiffening against both these motions."

It may be interesting to observe from the sketch of this failure made by Lt. Col. Reid in 1836 (Fig. 4) that the behavior exhibits a remarkable similarity to that of the Tacoma Bridge more than one hundred years later.

In 1840, Charles Ellet, Jr., proposed the construction of a suspension bridge of 1200 ft. span over the Mississippi River at St. Louis. In his report he devotes some space to a discussion of the probable effect of the wind and states:

> "Though it is very apparent that the work would thus be made perfectly secure against the force of any storm moving in a horizontal direction, there is yet reason to anticipate other movements which are not so easily prevented. There are irregularities in the force and direction of wind during very high storms which deserve to be considered. Vertical surrents frequently occur and exercise considerable lifting power."
>
> "In bridges of less span, constructed on this principle, the vertical force is easily neutralized by the construction of the parapet, and indeed considerable aid may be obtained from them in the plan before us."

In his report Ellet discusses the effect of concentrated loads in producing changes in form but makes no mention of the dynamic effect of moving loads.

The fact of an early interest in the problem of vibration and undulation in suspension bridges is evidenced by a paper presented by John Scott Russell to the Royal Scottish Society of Arts on January 16, 1839, and which bore the title "On the Vibration of Suspension Bridges and other Structures; and the Means of Preventing Injury from This Cause." A brief review of suspension bridge literature, however provides conclusive evidence of the general failure to appreciate and understand the dynamics of such structures.

It may be noted that although stiffness or resistance to change in form has always been recognized as a desirable quality the degree of such resistance as may be

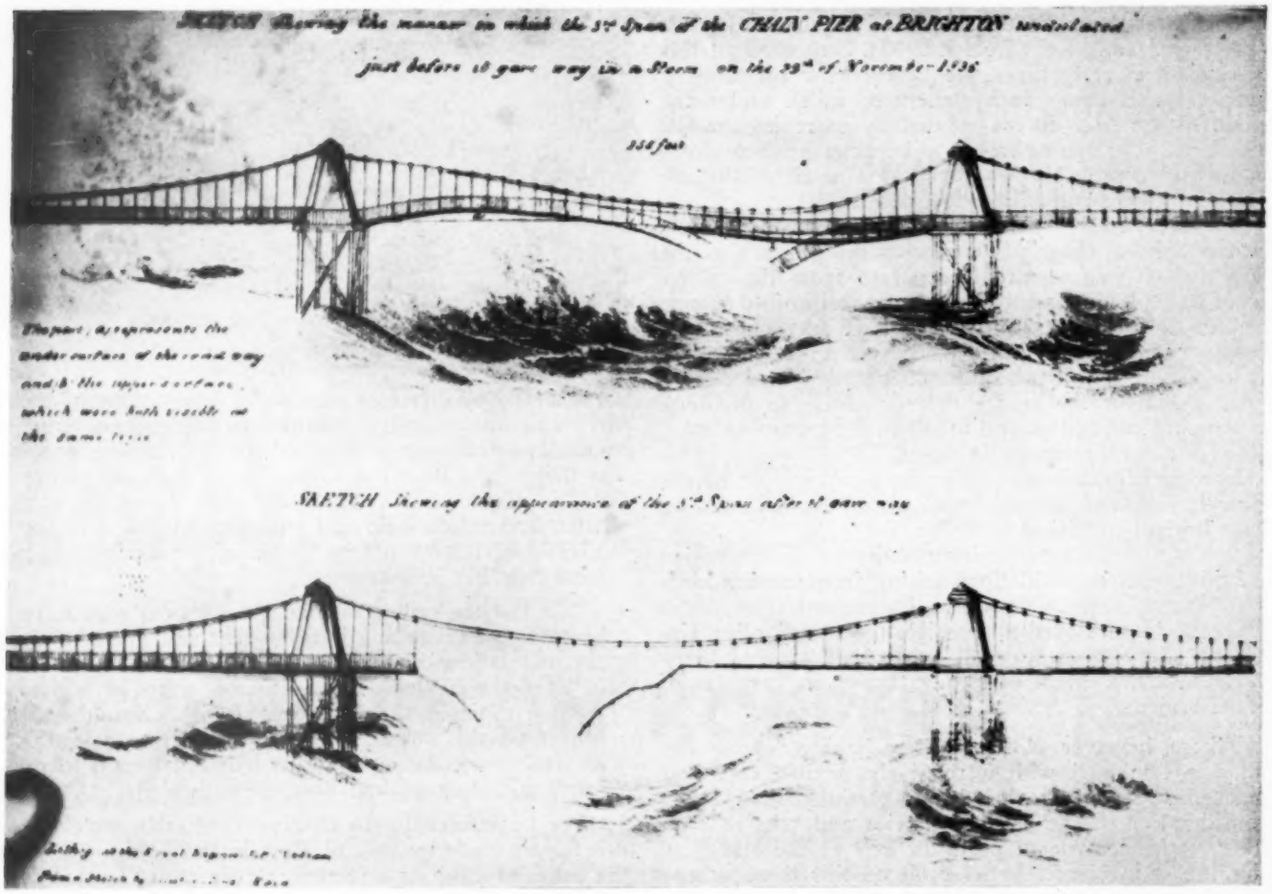
SKETCH shewing the manner in which the 3rd Span of the CHAIN PIER at BRIGHTON was situated
just before it gave way in a Storm on the 30th of November 1836
SKETCH shewing the appearance of the 3rd Span after it gave way

Fig. 4.—Failure of Brighton Suspension Bridge (England) in Wind Storm of Nov. 30, 1836. Sketch Made by Lieut.-Col. Reid, R. E. Trans. of the Royal Scottish Soc. of Arts, Vol. 1—1841, P. 304.

furnished by a given design has been and still is arbitrarily determined. The designer takes into account the proposed use of the structure, the nature of the loads which may pass over it, and considering the experience of previous similar constructions adopts the standard to be used in any given case. This procedure has been used since the time of Finlay and consists essentially in limiting the change of gradient of the roadway, due to concentrations of vertical loading, to such magnitude as is deemed to be consistent with the given situation. In 1848, Charles Ellet, Jr., proposed the construction of an 850 ft. span railway suspension bridge over the Connecticut River at Hartford. In his report on that project he discusses at some length the stiffness of the bridge under locomotive loading and after determining that the maximum deflection under a 20 ton engine would not exceed 3½ inches, states:

> "The apprehension, therefore, that the bending of the bridge will present an impediment to the progress of the engine and train is entirely groundless. There is no sudden angle formed in the flooring, but the slight depression that really has place is diffused, in all cases over at least half the length of span."

It is also of interest to note that in his design for this bridge, Ellet proposed to use built up wooden stiffening girders made of timbers placed one on the other and securely bolted. With respect to these and of the stiffness of the floor in general, he says:

> "No calculation is presented here of the strength of this platform or the resistance which it will offer to the weight of the trains; but it is submitted to the practical reader to decide, whether a flooring bound together by such girders, firmly secured at the ends to the massive abutments by staunch iron ties, and thoroughly bolted in the manner here specified, will not offer *some* resistance."

In a report to the Mackinac Straits Bridge Authority of Michigan on the proposed Mackinac Straits Bridge Project, dated June, 1940, Modjeski and Masters present the following specifications for stiffness:

> "The suspension structures are to be designed for a vertical change in grade under maximum loading and temperature conditions of not more than 2½% and a lateral change in direction below 4%."

Thus, even up to the present time engineers have focused their attention almost entirely upon the idea of furnishing stiffness to limit change in gradient of the floor and have been seemingly unmindful of the fact that in providing such stiffness they may also be producing resistance to undulations and the effects of unknown dynamic forces. Some of the recent literature on suspension bridges appears to confirm this. In an article by Leon Moisseif entitled "Growth in Suspension Bridge Knowledge" (Engr. News-Rec., August 17, 1939) it is stated that modern suspension bridges had their beginning when the Manhattan Bridge over the East River was built (1909), because it was the first such bridge to be proportioned and designed on the basis of the Deflection Theory and that this resulted in the conclusion that the vertical deflection of a suspension bridge is

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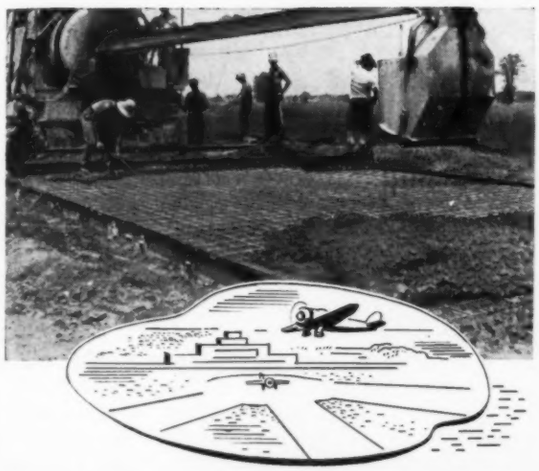

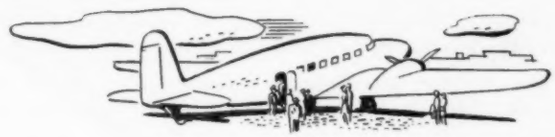

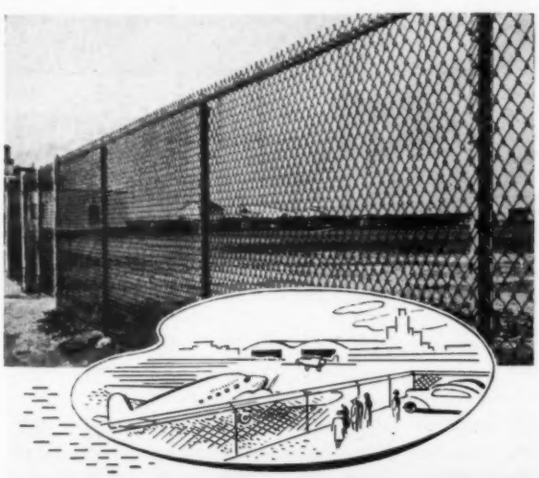

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not proportional to the moment of inertia of the truss but depends rather upon the weight of the structure and its main proportions. This article further states that in the building of the George Washington bridge (completed in 1931) it was strikingly brought home to engineers that the cable is the stiffest member in a suspension bridge. With respect to the latter principle, however, it is of interest to note that the French engineer, Seguin, stated in his book on wire bridges, published in 1824:

> "The Americans had adopted 1/7 of the spans for deflections of cables. This disposition, being very favorable, in reference to solidity, is inconvenient in regard to displacements, which become always the less the more the deflection of cables is diminished. But the Americans have neutralized that inconvenience by adding to the floors great masses, and using strong railings, to increase the rigidity."

In Mr. Moisseif's article no mention is made of the possible effect of the floor and stiffening trusses in resisting undulation caused by wind or dynamic forces or, in fact, of the need for providing such resistance in a bridge. Complete attention appears to be focused on the matter of vertical or horizontal deflection under known static forces. This probably accounts for the conclusions that stiffening trusses could be made shallower, in fact replaced by girders, and that the width to length ratios could be safely decreased for long span work.

Engineers are accustomed to measure the approximate relative stiffness of a member or structure in terms of the ratio of its lateral to its longitudinal dimension. Thus a piece is said to be slender and hence relatively flexible, when its width or thickness is small compared with its length. In the case of suspension bridges it has been the custom to measure the approximate stiffness by three general proportions: The stiffness of the cable by the "sag ratio" which is the ratio of the greatest sag of the cable to the span between towers; the lateral stiffness by the ratio of the width between cables or stiffening trusses to the span; and the vertical stiffness by the ratio of the depth of the stiffening truss or girders, at about the quarter point, to the span. No measure of torsional stiffness has, so far as we know, ever been applied to suspension bridges, nor is it apparent that the need for this form of resistance has ever been recognized. It may be observed that both the *width to span* and *depth to span* ratios are, however, approximate measures of torsional stiffness.

The degree of rigidity which should be provided in a suspension bridge has never been established, except as has been previously noted with regard to the effect of load concentrations in producing abrupt changes in gradient of the floor. The general proportions of previous bridges which have performed satisfactorily over considerable periods of time, have therefore served as a pattern followed by designs of subsequent bridges. Until recently engineers have been reluctant to reduce these proportions knowing that such change might produce a structure with undesirable motion and questionable safety. In his book "Suspension Bridges" written in 1922, Dr. D. B. Steinman states:

> "The economic ratio of sag to span of the cable between towers is about 1/9 if the backstays are straight and about 1/8 if the side spans are suspended. For light highway and foot-bridges the sag ratio may be made as low as 1/10 to 1/12. For adequate lateral stiffness the width, center to center, of outer stiffening trusses should not be less than about 1/24 of the span.
>
> "For a railroad bridge, the truss depth (at the quarter points) should not be less than about 1/45 of the span, or the deflection gradients will exceed one per cent. For highway bridges, the depth may be made as low as 1/50 to 1/60 of the span."

In the second edition of this same book published seven years later (1929), the author repeats his original statement concerning the sag ratio but says:

> "For efficient lateral stiffness, the width, center to center, of outer stiffening trusses or wind chords, should preferably not be less than 1/30 of the span.
>
> "The proper depth of stiffening truss is determined by the degree of rigidity desired. Reducing the depth

TABLE I—LONG SPAN SUSPENSION BRIDGES SINCE 1923

Bridge	Year Built	Span Between Towers	Length of Side Spans	Height of Steel Towers Above Masonry	Size of Cable (Diameter)	Cable Sag in Feet	Ratio Span to Cable Sag	Depth of Stiffening Trusses or Girders	Ratio Span to Depth of Stiffening Truss or Girder	Width Between Cables or Girders	Ratio Span to Width	Suspended Weight per Foot of Span Pounds
Bear Mountain	1924	1632	—	350	2 @ 18	—	—	Truss 30	55	55	30	—
Delaware	1926	1750	751	343	2 @ 30	200	9	Truss 28	63	89	20	26000
Ambassador	1929	1850	(972 (817	363	2 @ 19¼	206	9	Truss 22	84	67	28	—
Mid-Hudson	1930	1500	750	280	2 @ 16¾	149	10	Truss 20	75	42	36	8800
Mt. Hope	1930	1200	504	254	2 @ 11	120	10	Truss 18	83	34	35	5300
Geo. Washington*	1931	3500	650	565	4 @ 36	325	11	None		106	33	26035
St. John's	1931	1207	430	285	2 @ 16¾	121	10	Truss 18	67	52	23	—
Maysville (Ky.)	1931	1060	465	165	2 @ 13			Truss 14	77	28	38	—
Ile d'Orleans	1935	1059	417	218	2 @ 10	112	9	Truss 13	81	32	33	—
San Francisco Oakland Bay	1936	2310	1160	420 464	2 @ 28¾	210±	11	Truss 30	77	66	35	18400
Triborough	1936	1380	3904	271	2 @ 20⅝	138	10	Truss 20	69	98	14	19160
Golden Gate	1937	4200	1125	690	2 @ 36½	470	9	Truss 25	168	90	47	21300
Lion's Gate (Vancouver)	1938	1550	614	—	—	150	10.3	Truss 15	103	40	39	—
Thousand Islands	1938	800	350	—	—	—	—	Girder 6	133	30½	26	3200
Deer Island (Sedgwick)	1939	1080	484	—	—	—	—	Girder 6½	166	23½	47	2400
Bronx-Whitestone	1939	2300	735	363	2 @ 22	200	11.5	Girder 11	209	74	31	10940
Tacoma Narrows	1940	2800	1100	425	2 @ 17	232	12.1	Girder 8	350	39	72	6000
Mackinac Straits Bridge (Proposed)		(4600 (2950	(1600 (1050	— —	— —	— —	— —	— —	— —	(50 (50	(92 (59	— —

* As now built, bridge has no stiffening truss. When lower deck is added, a 29-ft. deep truss will be built between decks.

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TABLE II—SUSPENSION BRIDGE FAILURES DUE TO WIND OR DYNAMIC CAUSES

Bridge	Location	Span (Ft.)	Year Built	Date of Failure	Length of Life (Years)	Reported Cause of Failure
Dryburgh Abbey	Scotland	260	1817	1818	*6	Wind Storm
Union	England	449	1820	1821	*6	Blown down by wind
Brighton Chain Pier	England	255	1823	1836	13	Oscillation caused by wind
Menai Straits	Wales	580	1826	1839	13	Oscillations caused by wind
Broughton	England	145	1829	1831	2	Marching troops
Montrose	Scotland	432	1829	1838	9	Wind storm
Nassau	Germany	245	1830	1834	4	Wind storm
Roche-Bernard	France	641	1840	1852	12	Wind storm
Wheeling	West Virginia	1010	1849	1854	5	Violent wind—Inadequate stiffening
Lewiston	New York	1041	1850	1864	14	Under wind when wind cables were removed
Ostrau	Czechoslovakia	216	1851	1886	35	Dynamic effect of troop of cavalry
Steubenville	Ohio	700	1905	1923	18	Twisting under one-sided load; distortion being favored by the weak lateral and sway system
Tacoma Narrows	Washington	2800	1940	1940	*4	Oscillation due to wind

* Months.

diminishes the cost. For a railroad bridge of ordinary span-length, the truss depth should not be less than about 1/45 of the span, or the deflection gradients will exceed one percent. For highway bridges, the depth may be as low as 1/50 to 1/70 of the span, for spans up to 1000 ft.; 1/70 to 1/40 of the span, for spans up to 2000 ft.; 1/90 to 1/150, for spans up to 3000 ft.; and the stiffening trusses may be dispensed with for longer spans. The increasing ratio of dead-load to live-load reduces the need for extraneous stiffening."

The general dimensions of 17 long span suspension bridges built since 1924 are listed in Table I. Three of these structures, namely Thousand Islands, Deer Isle and Bronx-Whitestone bridges have shown such tendency to oscillate as to require the installation of corrective devices; a fourth, the Tacoma Narrows Bridge, failed. Considering the remaining 13 bridges which have been to date successful: one, the George Washington, is completely unstiffened, but embodies very heavy cables and a heavy floor; twelve of these bridges employ stiffening trusses, not girders; two bridges have stiffening trusses less than 1/84 of the span in depth, one using a ratio of 1/168 but with a large dead load and the other a ratio of 1/103; only one bridge has a width less than 1/38 of the span and this, the Golden Gate, has a width-span ratio of 1/47. It is obvious from a consideration of this table that the trend in the last ten years has been toward decreasing the sag ratio for the cables and elimination of stiffness, both vertical and lateral, for the suspended floor. In regard to such trend, it is of interest to note the controversy which existed more than 100 years ago between the French and English school of engineers, led by Navier, and the American group, led by Finley. Navier believed he could prevent greater displacements by using flat catenaries and advocated perfectly moveable floors and sag ratios of 1/12 to 1/15 for the cable; on the other hand Finley and his American followers advocated stiff platforms with strong rigid railings to resist displacements and used a sag ratio of 1/7 for the cable.

Table II lists the most important suspension bridge failures of the past 123 years which have resulted from wind or dynamic causes. It is significant to note that all but two of these failures are of bridges designed and built either in or before the year 1851 and one of these occurred during the past year (1940). Out of the early failures developed the empirical laws of proportion which have governed all suspension bridge design to within the present decade. The danger which lies in arbitrarily tampering with these proportions is clearly shown by the performance of recent construction.

In the case of long span bridges the potential savings which may result from reducing the width or of eliminating much of the material customarily used in the stiffening system is enormous. The designer is obviously under great pressure to make such reductions and finds it extremely difficult to justify the expense of such auxiliary construction on the basis of opinion or empiric rule. Thus in the case of the unfortunate Tacoma Bridge it has been stated that the conditions required a very long span and that the anticipated travel could not sustain more than the cost of a two-lane bridge with relatively small funds available to meet it.

If long span bridges are to be built, as of course they must, considerations of economy demand that they be patterned to fit accurately their particular need. In order to accomplish this, the designer must be in possession of all the facts and conditions which relate to the behavior of such structures. The evaluation of the forces which may act on the structure must be complete and the dynamic behavior must be taken fully into account. There has been a lamentable lag on the part of structural engineers to apply sound aerodynamic principles to structures exposed to the action of the wind. The magnitude and nature of wind force acquires great importance on very large structures yet the specifications used at present take no account of the size of the structure nor in fact do other than offer crude approximation of the true effects. In the case of studies of the behavior of the Bronx-Whitestone Bridge it is stated (Engr. News-Record, Dec. 5, 1940) "the actual forces that set up motions of the bridge could not be reproduced, as they were unknown." Matters relating to vibration and dynamic stability have hitherto not been generally regarded as important and for structures of the massive proportions built in the past this may be true. For the modern structure and for those of probably more slender proportions which will undoubtedly be built in the future, however, such factors cannot be neglected.

The answers to the questions which now confront engineers relative to these matters can be found only through the agency of fundamental research. Such research will seek to establish not only the magnitudes and nature of forces which are now unknown but will also evaluate the dynamic effects which may be produced in structures of slender proportions.

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EEL RIVER BRIDGES, CALIFORNIA

Construction Features of North Scotia and Robinson Ferry Structures on Redwood Highway

WORK on the two steel and concrete bridges on the Redwood Highway, U. S. Route 101, is proceeding well ahead of schedule. These bridges replace the two existing county built bridges which have been subject to load and speed restrictions for several years. It has been necessary to have three shifts of watchmen on each of the bridges to enforce the posted limitations.

Taking advantage last Fall of a late rainy season and a resultant small river flow, over 90 percent of the work has been completed in 60 percent of contract time.

Heavy river flow may occur in the Eel River as early as October and as late as April. The past season no large flow occurred until December. Erection of the structural steel spans over the main river channel on the Robinson Ferry bridge was completed on Oct. 23, 1940 and on the North Scotia bridge on Nov. 29, 1940. In normal seasons flood conditions would prevent or make extremely hazardous the erection of structural steel until Spring.

The Eel River rises in the San Hedrin Mountains and drains an area of 3100 square miles, much of which is heavily timbered. The normal rainfall at the upper water shed is around 100 in. An estimated probable flow of 370,000 second feet could occur at the bridge sites. In the Spring of 1940 a flow of 304,000 second feet was observed. Besides the large runoff there is the danger of large redwood trees floating down the river during flood periods.

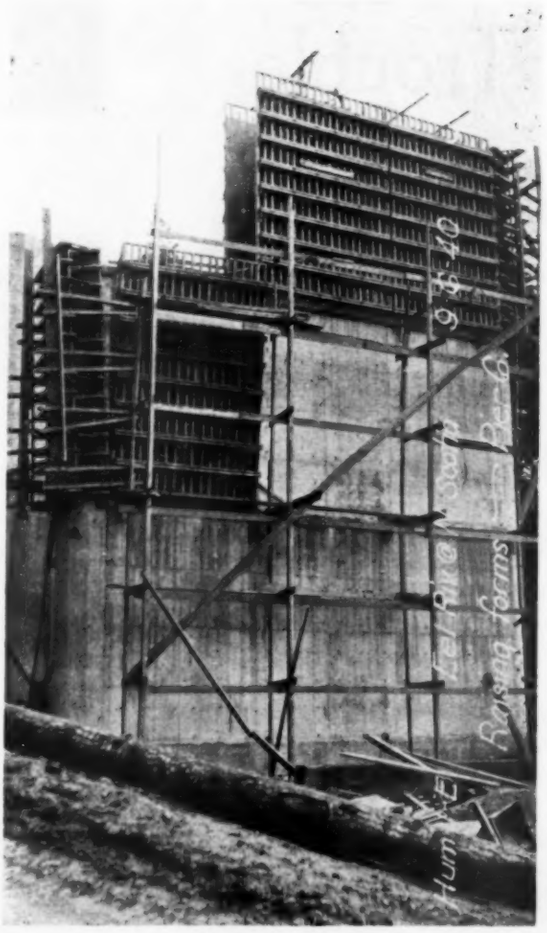
One of the design considerations was to provide long enough channel spans to pass safely the extremely heavy drift.

Features of the Bridges

The bridge at North Scotia consists of a 3-span continuous truss over the main channel with seven concrete girder approach spans. The central span of the continuous truss is 322 ft., center to center of pier, and the side spans are 240 ft. in length.

The Robinson Ferry bridge which is 1½ miles north

General View of Site, North Scotia Bridge



Typical Pier Forms, North Scotia Bridge

of the North Scotia bridge consists of three 300-ft. simple truss spans over the river channel and twelve concrete girder approach spans. At this latter location a study indicated that a skew crossing would avoid undesirable alignment conditions and shorten the roadway approaches somewhat. A unique design feature is the vertical portal bracing masking the skew. Use of this type of portal bracing and the spacing of the floor panels to secure square framing simplified fabrication details with resultant economy.

Interesting features of the North Scotia continuous truss are the omission of milled joints and the fixing of the center piers with rocker bearings provided at the end piers. Bending of the central piers is designed to take care of movement in the central span. All the main piers are of cellular construction as are those on the Robinson Ferry bridge. Roadway grade on the North Scotia bridge is 90 ft. above stream bed. Connection with the highway through the town of Scotia

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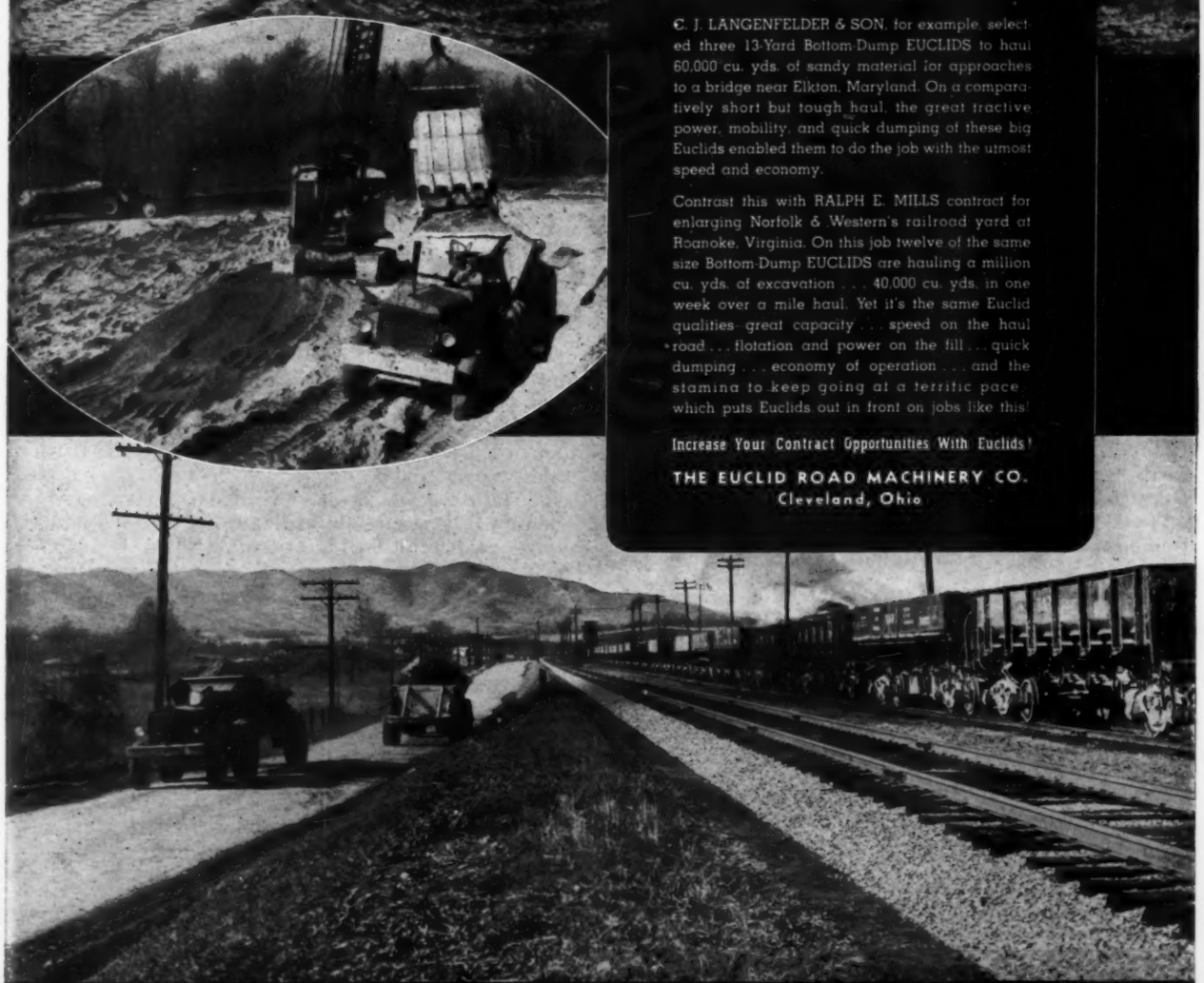

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General View of Site of Robinson Ferry Bridge, Looking North, at Start of Work

and Wildwood determined the bridge grade at this site. On the Robinson Ferry site the new bridge is on a new roadway alignment and together with a wider river channel at this point enabled the construction of a somewhat lower height bridge, 68 ft. above stream bed.

Foundation Conditions

A sandy shale increasing in hardness with depth was available for the main pier foundations at both sites. The shale had little or no overburden in the main channel at the North Scotia site but was overlain with stream bed gravel at the Robinson Ferry bridge. The main channel piers at North Scotia were carried 25 ft. and 18 ft. below stream-bed. Piers 3 to 6 on the Robinson Ferry bridge varied in depth below streambed from 25 to 40 ft.

At the North Scotia bridge the bedding plane of the shale was horizontal and the contractor was able to excavate both channel piers in the dry without the use of sheathing.

On the Robinson Ferry bridge the contractor was not so fortunate. The bedding planes here dipped at about 50 degrees to the horizontal with a 45 degree strike to the centerline of the roadway. Cofferdams were necessary at this site and heavy pumping was necessary at times. At Pier 5 a double cofferdam backfilled with earth was constructed to shut off the surface flow. Excavation was done by means of air spades and the material removed by a clam shell bucket. Depth of the footings in the shale bedrock varied from 2 ft. for Pier 1 to 30 ft. at Pier 3.

Pile foundations were utilized for the approaches of the North Scotia bridge and the north approach of the Robinson Ferry bridge. Cast-in-place concrete piles were used for the approach footings except in Piers 5 and 10, on the North Scotia bridge. Steel H-piles were driven on the north approach piers of the Robinson Ferry bridge and in Piers 5 and 10 on the North Scotia bridge. Pre-cast concrete test piles at Robinson Ferry would not penetrate sufficiently into the gravel stratum, composed of large cobbles, so that steel H-piles were substituted in order to secure a greater penetration of pile for security against possible future scour.

Construction of Substructures

Concrete aggregates for the Robinson Ferry bridge were secured from a gravel bar upstream from the bridge. A portable screening plant set up and moved as needed on the river bed and the material hauled and

Footing of Pier No. 3 of Robinson Ferry Bridge

stockpiled near the batching plant on the south bank. Most of the aggregate for the North Scotia bridge was secured from a commercial plant about twelve miles away.

The concrete plant on the North Scotia bridge was constructed on the north bank to take advantage of the steep slope for the plant set-up. The plant consisted of timber bunkers, which could be loaded by trucks from about road level. Below the bunkers were the batching scales and aggregate hopper which discharged directly below into a 1-yd. paver converted for stationary use. The mixed concrete was hauled to the various locations by trucks with a body capacity of two 5/6 cu. yd. batches. The concrete was deposited into forms by means of buggies or from a ¾ cu. yd. bucket mounted on a crane.

General View During Steel Erection, North Scotia Bridge

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Erecting Structural Steel, Robinson Ferry Bridge

Concrete Pumped Into Place

On the Robinson Ferry bridge all of the concrete, except for the first few pours, was mixed and pumped into place by a 1-cu. yd. pumpcrete machine. Weighing approximately 18 tons, this machine was originally mounted on railway trucks but had been converted and mounted on rubber-tired wheels for this job. A tractor was used for moving it from one set-up to another. During operation, trucks holding two 1-yd. batches hauled the dry material from the batching plant to the pumpcrete machine. The loose hopper bodies on the trucks were hoisted and dumped into the open end of the mixer. The units of the pumpcrete machine: mixer, re-mixer and pump were respectively operated by 30, 10 and 40 H.P. electric motors. The re-mixer motor also powered the hoist. A 6½-in. discharge pipe line was used from the pump to the place of deposit. The longest line used on the job was 450 ft. and the highest lift was 66 ft.

Falsework and Forms for South Approach, Robinson Ferry Bridge

The pumpcrete plant operated very successfully with very little trouble from "plugging." When the pipe lines led down hill trouble would occasionally occur from "plugging" due to the concrete not entirely filling the pipe.

In the pouring of the tremie seals for Piers 5 and 6 the pumpcrete machine worked very successfully. 320 yds. of concrete was placed on the tremie seal for Pier 5 in 13¾ hours or at a rate of over 23 cu. yd. per hour. Seal pouring operations were facilitated by a flexible elephant trunk connecting the pumpcrete line with the tremie tube. From 20 to 30 cu. yd. an hour could be deposited into forms. On the main piers, the pours were made in 19 to 20 ft. lifts. The concrete was pumped over the end of the piers 8 ft. above the forms and distributed to chutes and elephant trunks placed along the walls.

For pouring the deck on the approach spans, the pipe line was supported on wooden horses 7 ft. high and the concrete distributed by a swinging chute. Sections of pipe were removed as the deck pours advanced.

On the steel spans the contractor utilized the intermediate bracing for supporting the pipe line. The pipe was 15 ft. above the deck and a full 20 by 28 ft. panel could be poured from one placing of a flexible elephant trunk.

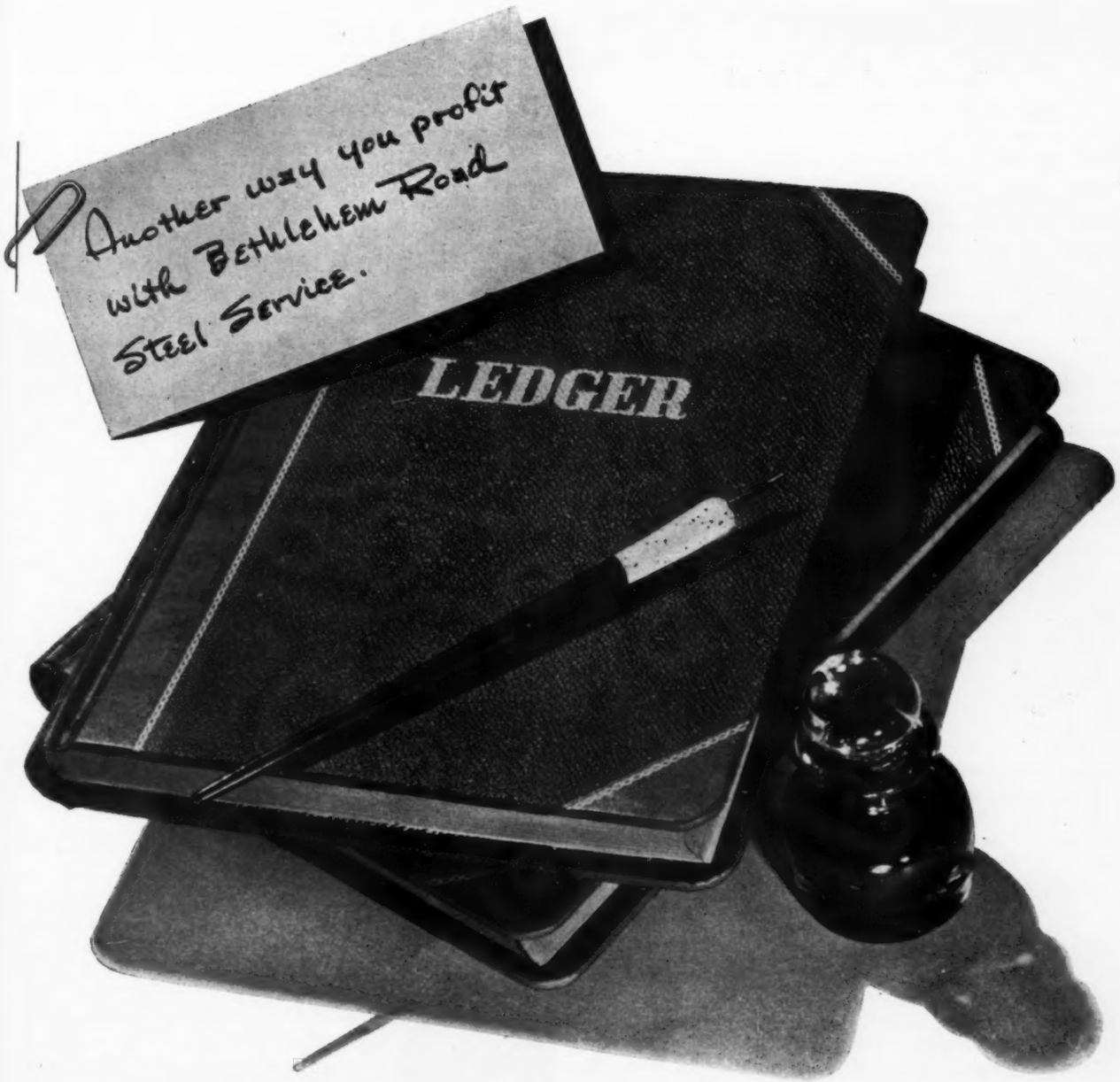
The large capacity equipment plus good organization

General View of Completed Robinson Ferry Bridge

enabled the contractor to pour a section of deck on the north approach spans 165 ft. in length and 36 ft. wide in 8 hours. On the steel spans a pour 150 ft. in length by 28 ft. in width was made in 6 hours.

All concrete was consolidated by vibrators. Six sacks of cement per cubic yard of concrete was used throughout both jobs. The average strength of concrete was approximately 500 p.s.i. in 28 days.

Forms and formwork followed general practice. Forms for exposed surfaces were lined with plywood. Typical falsework for the concrete approach spans consisted of 4-in. x 4-in. posts at 3-ft. centers set on a continuous 4-in. x 12-in. which rested on a continuous pad of 3-ft. planks placed on a sand cushion. Maximum settlement on this type of falsework was ½ in. with the average less than ⅜ in. On all spans a residual camber was left to compensate for future deflection from plastic



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flow. The amount varied depending on span lengths and ranged from ⅜ in. to ¾ in.

Erection of Steel Work

On the erection of the structural steel both contractors chose to use falsework in their erection scheme. Falsework for the Robinson Ferry bridge consisted of well braced 12-in. x 12-in. posts set on short pile bents. A somewhat similar system was used on the North Scotia bridge with the exception that natural poles were used in place of sawn timbers. Poles up to 70 ft. in length were used. No falsework was built for a length of four panels south of Pier 8 in order to leave a clear opening in the main channel section in case of a rise in the river.

The structural steel was shipped in by rail and hauled directly from cars to the job sites. On both bridges the steel was yarded in the bed of the river channel from where it was picked up by the erection equipment on the bridge.

On the Robinson Ferry bridge the steel erector used an unusual piece of equipment for hauling and yarding the steel. This was a Ross lumber carrier having a 7-ton capacity. The steel was easily and economically moved and the blocking used in lifting and carrying remained in place under the steel when lowered to the ground. This kept the steel clean and also facilitated future handling. The carrier crew consisted of an operator and a ground man. A 15-ton truck crane was used for unloading the steel and also for erection of the trusses. On the erection work the crane was run on blocking set on the stringers. Outriggers and hold down bolts were used to prevent uplift when booming out. The three trusses were erected in 33 working days.

A travelling stiff leg derrick was used in erecting the steel on the North Scotia bridge. The derrick was assembled on the north approach. The ground here was almost to deck grade and the derrick was moved into position as soon as the north approach spans had attained the required 3000 p.s.i. concrete strength. Erection proceeded along conventional lines.

All main points were pinned and bolted 100 per cent. The special provisions on both contracts provided that the trusses be completely assembled and reamed in the shop. As a result no field reaming of these members was necessary and no difficulty was experienced in making connections. To secure a better alignment on the steel rails, the plans called for welding the rail posts to the sidewall channel and brackets after the deck slab was poured. The corrugated sidewalk plates were plug welded to the sidewalk stringers.

Both bridges were designed for the use of alloy steel. The contractors had the option of using nickel copper steel, Cor-Ten, Mayari-R or Inland High steel. Physical property requirements of the steel were:

Yield point, lbs. per sq. in.	50,000 min.
Tensile strength, lbs. per sq. in.	70,000 min.
Elongation, percent in 8", 3/16 & over	1,500,000 T.S min.
Elongation, percent in 2", under 3/16	22 min.
Cold bend	180° d=t

General Contract Data

Table I shows the principal contract items and the contract prices.

Bids on the Robinson Ferry bridge were received on Jan. 24, 1940. The contract time was 450 days and the contract completion date is August 12, 1941. Engineers Ltd. of San Francisco were low bidders with a bid of $455,580. A total of 14 bids were received.

TABLE I

Item	Robinson Ferry		North Scotia	
Clearing and grubbing	1 lot	$750.00	1 lot	$3,000.00
Water	150 M gal.	1.75	150 M gal.	1.00
Roadway excavation w/o cl.	— — — — —		9700 c.y.	0.30
Struct. exc.—Type A	4600 c.y.	4.50	1700 c.y.	4.50
Struct. exc.—Type B	2400 c.y.	1.25	2000 c.y.	1.30
Imported borrow	9000 c.y.	0.60	— — — — —	
Bar reinf. steel (furn.)	945,000 lbs.	0.03	680,000 lbs.	0.03
Bar reinf. steel (placing)	945,000 lbs.	0.01	680,000 lbs.	0.0075
Class "A" PCC (Footing blocks)	1680 c.y.	7.75	935 c.y.	8.00
Class "A" PCC (Struct.)	5590 c.y.	18.50	3800 c.y.	21.00
Structural alloy streel (furn.)	2,520,000 lbs.	0.06	1,950,000 lbs.	0.065
Structural alloy steel (erection)	2,520,000 lbs.	0.029	1,950,000 lbs.	0.02
Misc. iron and steel	8,000 lbs.	0.14	5800 lbs.	0.15
Steel railing	3226 l.f.	6.50	2285 l.f.	6.00
Furnish concete piles	8970 l.f.	1.75	3774 l.f.	1.70
Driving concrete piles	299 each	17.00	137 each	60.00
Misc. items of work	1 lot	4000.00	1 lot	3154.00

Bids on the North Scotia Bridge were received on Feb. 14, 1940. The contract time allowed on this job was 400 days. The contract completion date is July 28, 1941. A. Soda and Son of Oakland were low bidders with a bid of $330,000. A total of nine bids were received on this job.

The work was carried out under the direction of the Bridge Department, Department of Public Works, Division of Highways, State of California. C. H. Purcell is State Highway Engineer and F. W. Panhorst Bridge Engineer. Harry Carter was Resident Engineer on both projects.

MACATEE ELECTED MANAGING DIRECTOR OF THE ASPHALT INSTITUTE

W. R. Macatee

At the annual meeting on March 12 of the Board of Directors of The Asphalt Institute, W. M. Macatee was elected managing director to succeed the late J. E. Pennybacker, who died on Feb. 25. Heretofore Mr. Macatee had been serving as assistant and also as acting managing director. He was appointed to the newly created post of assistant managing director on Feb. 3, 1941. In his new position Mr. Macatee also will continue in direct charge of the Washington, D. C., office of the Institute.

Mr. Macatee became connected with the Asphalt Institute in 1935 when he was placed in charge of a new field office of the Institute at Cincinnati, O. Previous to that he had been for a number of years identified with the asphalt industry and later with the Portland Cement Association. When in 1939 The Asphalt Institute established a district engineering office at Washington, D. C., Mr. Macatee was promoted to the new post.

Major Macatee saw war service with the U. S. Marine Corps in Hawaii, Santa Domingo and France.

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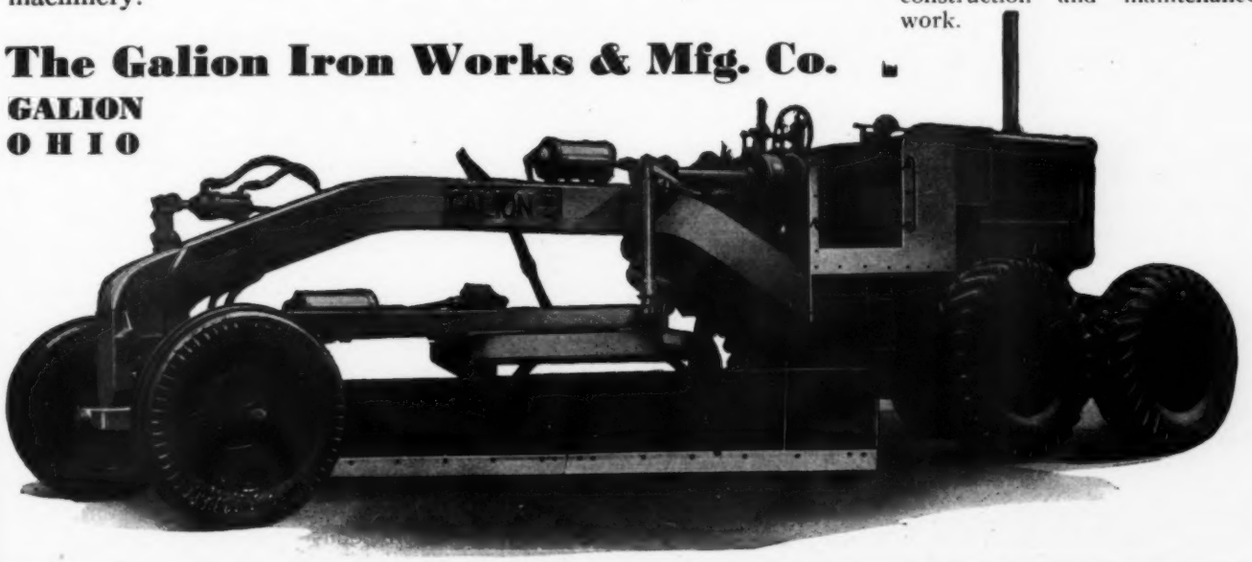

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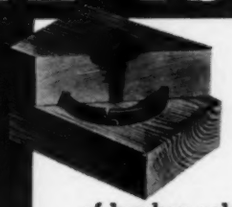

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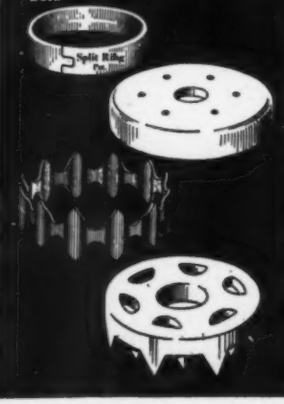

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EDITORIAL

GOVERNOR HOLLAND SUGGESTS

FLORIDA has a 7-cent gas tax. The state also collects a gax tax of ⅛ cent for gasoline inspection and a motor vehicle license fee. The 7-cent tax is distributed as follows:

3 cents for the state road department.
3 cents, called "second gas tax," for the redemption of bonds issued by counties for the purpose of building roads.
0.5 cent for general state revenue.
0.5 cent for schools.

In all, the gas tax amounts to about 33 or 34 million dollars of which about 12 million dollars goes to the state road department for construction, maintenance, administration, and operation of the state road system.

All of the motor vehicle license fee collections are allocated to schools. It is argued by many people and many state officials that this legal stipulation is morally sound and in no way partakes of the nature of "diversion." It is argued that the basis for that taxation is broad and justifiable. It is not the purpose of these remarks to discuss this point, but to discuss a condition that exists with respect to the "second gas tax" funds.

The "second gas tax," that 3-cent portion of the 7-cent state gas tax, which is used to redeem outstanding county bonded indebtedness, or "county contributions," is allocated on the books of the state among the various counties on the triple basis of area, population, and "county contribution." County contribution means the amount of money that each county was presumed to have expended on "state designated" roads between 1915 and 1931. It is also called a "county credit." This amount was set up on the books as a credit to the county because it was presumed that the county had expended that amount, or "contributed" that amount to the state for construction on "state designated" roads.

A little more background is necessary by way of explanation. A "state designated" road is one which is part of a pool out of which "state maintained" roads are selected. No state construction or maintenance money, in general, may be spent on any other than the "state maintained" system. Hence, these "state designated" roads are county roads which are merely designated by the state as being roads it may some day take over for construction and maintenance. The "state maintained" system is that network of roads commonly referred to in other states as the state highway system as distinguished from a county or township road system.

It was stated above that these county credits were set up on the state books and a portion of the gas tax, called the "second gas tax" is used to pay off or offset these credits. In a few cases, these credits brought real cash to some of those counties which had already paid off their indebtedness or which had levied an ad valorem tax to follow a pay-as-you-go policy. In other counties a large bonded indebtedness still exists. To make our problem simple we will assume that the bonded indebtedness is jut equal to the county credit. Such would be the case if the county had borrowed all the funds for that 1915 to 1931 construction work and spent them only on the state designated system.

It is in the manipulation of the bonded indebtedness where, it would seem some financial agencies are "using" those counties in Florida that have been unable as yet to pay off the indebtedness. They are exacting seemingly excessive fees for short period refinancing from those unfortunate counties. It could not be done, or rather would not be done, if the county commissioners and other influential state and county officials had the well-being of the taxpayers of the county at heart.

In one case a county was charged approximately $300,000 for refinancing an approximately $10,000,000 loan in which a reduced rate of interest was given. The difference in the cost of interest, however, was added to the end of the financing period as additional principal. In this case it took all of that county's share of the "second gas tax" allotment to pay the refinancing charges.

The "second gas tax" allotments are used: first, to reimburse the set-up county credits; or second, to be spent on construction of roads on the first or second preferential system, in equal amount, if the bonded indebtedness was cleared; or third, after the first and second provisions were satisfied, the annual allocation of a specific county would revert to the state road department for expenditure anywhere in the state.

This last provision was useful because the state road department used those funds to help out counties that could not meet their bond retirement payments.

The system of allotting the "second gas tax" to the credit of counties, built a "surplus" for those counties which had paid off their bonded indebtedness or where the amounts received were greater than the amounts that had to be paid for bonded indebtedness. This is a phase of Florida financing that smacked of "diversion."

Those counties which had accumulated surpluses began to demand that the surpluses be spent in their counties. In some cases in the past, a court house, or a school house has been built out of these funds. This practice has been stopped, however, and it was to correct the apparent injustices of the allocation procedure as well as to prevent financing companies from "milking" the public that Governor Holland at a conference of the Executive Committee of the County Commissioners' Association on March 17th, 1941, at Tallahassee, Florida, made the following suggestions:

1. Early in the 1941 legislative session, designate as state roads all existing county roads which form integral parts of the state highway system but which heretofore have not been so designated.

2. In place of Senate Bill 1217, enact a bill similar to Senate Bill 1217 to set up additional credits for the counties for the cost to them of all roads designated as state roads since the 1931 Gas Tax Act, including those as outlined in Paragraph 1 above. Request the legislature to defer action on veto of Senate Bill 1217 until action is taken on bill suggested in preceding sentence.

3. Take one-third of each cent now distributed to counties and allocate it to the State Road Department for maintenance and construction of state roads. The distribution of the remaining two-thirds of each cent of the Second Gas Tax to continue undisturbed in accordance with the factors of area, population and roads contributed as provided in the 1931 Gas Tax Act.

4. Redefine "surplus" as used in the 1929 Act (State

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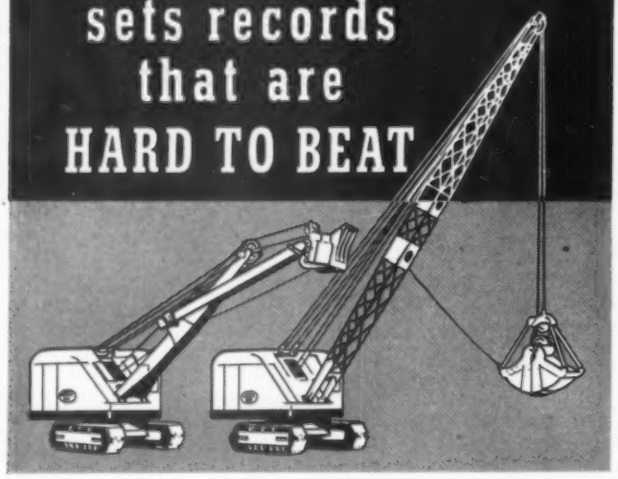

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Board of Administration Act), the 1933 Act (the Kanner Act), and the 1939 Act (Senate Bill 1218) to mean the annual amount remaining in the counties' Second Gas Tax allotment over and above the amount annually required to pay principal and interest and to create sinking fund on its road bond indebtedness, instead of the amount remaining of its total gas tax credit after the retirement of its total road bond indebtedness has been provided for.

5. In order to provide a cushion to protect the counties against the loss of one cent of the present three cents of the Second Gas Tax, it is suggested that the State Board of Administration be authorized to use any sinking funds in the account of any county to buy at not more than par plus accrued interest at not to exceed 3%, such bonds of any other county or special road and bridge district which are in default, or in danger of default, because of inadequacy of revenue with which to meet such matured or maturing issues or interest thereon, with proviso that such sinking funds shall be returned to the county account from which they were taken, either (1) from cash received as the purchased bonds may be refunded, or (2) as the credit payments accumulate to the county or special road and bridge district (whose bonds were purchased), sufficient to replace such sinking fund.

6. At the option of the Board of County Commissioners, the annual surplus in any county account to be distributed by the Board of Administration as follows: 80% to the State Road Department to be used in the construction or reconstruction of any state road within the county, and 20% to such county for use exclusively on local roads or bridges therein.

7. Provide that after a county's credits have been exhausted under the 1931 Gas Tax Act and revised Senate Bill 1217, instead of an amount equal to the annual allocation of such county being expended by the State Road Department on the preferential system roads in the county, that such amount be expended as follows: 80% thereof by the State Road Department for the construction or reconstruction of any state road in the county, and 20% thereof to such county for use exclusively on local roads and bridges therein.

8. To provide a secure foundation for the permanent solution of the county and road and bridge district debt problem, and to assure lower interest rates, it is suggested that a constitutional amendment be submitted for adoption providing that not exceeding 2 cents of the gas tax can be used and pledged by the Legislature to pay the indebtedness incurred by the counties and road and bridge districts for roads and bridges heretofore constructed and included in the scope of the Gas Tax Act of 1931 and revised Senate Bill 1217, or to be hereafter constructed in the several counties by the State Road Department.

9. Recommend consideration of Brookings' Institution report and other suggestions to the effect that the statutory powers of management of county road bond matters pertaining to all bonds participating in the benefits of the 1931 Gas Tax Act, shall be transferred, in whole or in part, from the Board of County Commissioners, or Bond Trustees, to the State Board of Administration. (The Governor stated that inasmuch as he was a member of the State Board of Administration, he would not make any specific recommendation in this field, but that he felt that the Committee would want to earnestly consider the proposal for increasing authority of the Board of Administration in any way that the counties could be aided by such course.)

Besides these suggestions by the Governor, fair minded financing agencies might well group together

for the purpose of policing their business. If bonding companies are going to hope to enjoy future business in Florida they must find the most economical way to finance public facilities and do so at the very minimum cost to John Q. Public. Lining pockets and "milking" the public is mighty poor business policy in the long run.

The Florida legislature would only be doing its proper function to completely fulfill the obligations imposed by the Governor's suggestions. Many of the men who will have a vote in the legislature on these suggestions have worked very closely with the financing agencies in the past. Protecting John Q. Public in Florida against unfavorable financing schemes is obligatory on the legislature whose membership is supposed to represent Mr. Public. If they fail to do so, the people of the state should be able to read *all* of the sordid details connected with a bonding company's effort to protect refinancing schemes.

A word of explanation is in order regarding the first point in the Governor's suggestions. To designate county roads as state roads does not mean that the state will take the roads for construction and maintenance. It merely means that those county roads not already classified as "state designated" roads should be so classified since this classification is a pool out of which roads are selected for the "state maintained" system.

Since the county and state designated roads are a preponderant proportion of all roads in the state the Governor's first suggestion merely broadens the base for calculating county allotments from the "second gas tax." It has the effect of smoothing out inequalities. The Governor's suggestions are certainly conservative. Why not boldly assume all county indebtedness, refinance the whole total in the name of the state, use the necessary portion of the "second gas tax" for redemption of the bonds and spend the balance for new state road construction? In the writer's opinion the Governor's program is not bold enough; the state needs a new highway code.

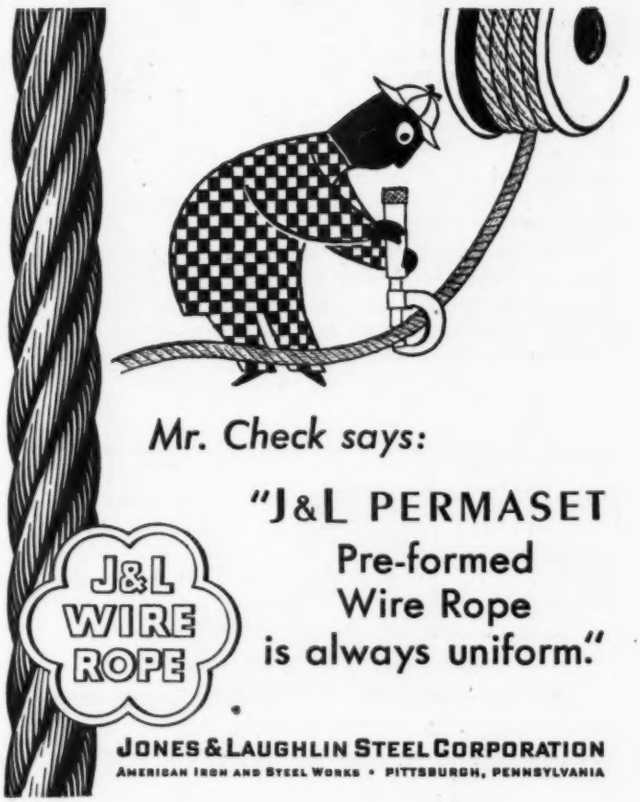
NATIONAL DEFENSE COOPERATION

PATRIOTICALLY the highway departments of the South have over extended themselves to provide access roads for Army, Navy, and Marine establishments. They have spent their sorely needed funds for roads to satisfy defense needs to the detriment of their construction programs. Some of the states have leaned over backward in an endeavor to cooperate.

Access roads are, without doubt, the responsibility of the federal government. The roads are to be used for purely national defense purposes and after the defense period is over they will have no value to the people of the state. Projects that were scheduled for construction or improvement in various parts of the states have had to be deferred because all available funds have been used in access road construction. Dixie is to be complimented for its patriotic demonstrations of a desire to cooperate in national defense to the fullest measure. They should not be allowed, however, to take the access road "blow" to their highway funds. What states have expended on access roads should be refunded to them out of strictly federal funds.

In Florida, for example, access defense road requirements have been estimated to cost approximately $12,000,000. Already the state has drained its highway funds to the amount of nearly $3,000,000.

States which have already spent their regular highway funds for access road construction must be reimbursed by the federal government if fair play is to be expected.



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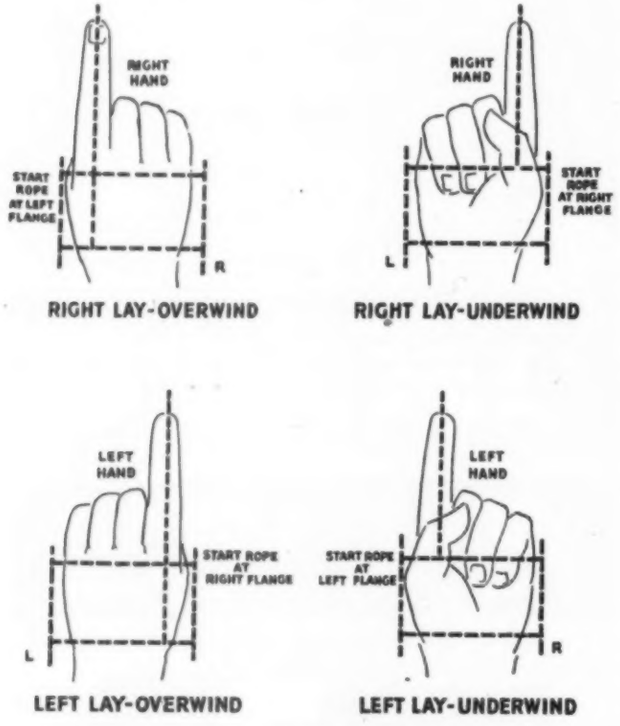
ROAD BUILDING SYSTEM

DRUM REEVING SIMPLIFIED

There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum. If started at the proper flange the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from a layer above might squeeze and cause serious scrubbing, scarfing or binding. If a rope is not to damage itself prematurely the wraps must lie close together.

To reduce the tendency for rope to spool unevenly, many users are employing the preformed type, since in the manufacture of this type of rope practically all internal torsional stresses are eliminated. One result of "preforming" is to make the rope resist rotating when



Illustrating a Simple Rule for Drum Reeving
Photos Courtesy American Cable Division American Chain & Cable Company, Inc.

passing over drums and sheaves as is common with non-preformed. This resistance to rotating, whipping, together with its freedom from "crankiness" permits preformed rope to spool much better. However, regardless of the type of rope used, *all* ropes should be properly started on the drum. Here's the rule:

When a right-lay rope is being underwound on the drum (which is to say, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear. If a left lay rope, start it from the left flange. Conversely, if a right lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange. If a left lay rope (overwound) start it from the right flange.

That's a complicated rule to remember, and more frequently than not quick reference to it is not available at the machine. . . . So—here's a far simpler rule—using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left lay rope use the left fist. For overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.

"AS THE ENGINEER MAY DIRECT"

You will all agree that there are as many personalities in the engineering profession as there are members of the profession in practice. The expression "as the engineer may direct," so commonly used when it is difficult to write a definite specification is perhaps the greatest variable with which the contractor must contend.

The construction industry cannot exist without competition. After all, we are human and we cannot avoid being influenced by personal likes and dislikes in our associations with our fellowmen. To make it possible for the peculiar likes and dislikes of an individual to appear in a contract which involves competitive bids is placing an unnecessary burden on the construction industry and the use of the above expression will be reflected in higher bid prices. If he will only say what he wants done, thereby eliminating an uncertainty for the contractor, the engineer is certain to obtain better and more commensurate bid prices. Take for instance an item of rubble masonry in a ditch. The selection of suitable rock alone may be varied enough to raise costs many times over the unit bid price. I recall an instance where this item in a remote mountain region was required to be finished by the engineer to such "hair-line" dimensions that the contractor lost money on the job. This happened because the contractor went over the project with a different engineer than the one who subsequently was in charge of construction. The difference in opinion about the meaning of a clause in the Specifications was the difference between profit and loss. In spite of the fact that the rubble masonry was required to be finished to a standard that would do justice to a metropolitan park, it is now covered with debris in the ditch on one of the lesser traveled routes in the State of Wyoming.

We earnestly solicit the cooperation of the highway departments in eliminating the clause "as the engineer may direct."—From a paper by John E. Wiley, Engineer Secretary Associated General Contractors of Wyoming, presented at the 1941 Highway Engineering Conference at the University of Colorado.

OHIO HIGHWAY DEPARTMENT EMPLOYS METEOROLOGICAL EQUIPMENT

The Ohio Department of Highways will make use of the federal governments' $100,000 worth of equipment of the Muskingum Climatic Research Center scattered over the state in determining rainfall, run-off volume of water, wind direction and velocity, stream capacity and other meteorological data. O. W. Hunn, an engineer formerly employed by the Muskingum Climatic Research Center, has been named as Meteorological Station Inspector.

While there is a concentration of the observatory equipment in the 27 counties of the Muskingum conservancy district—an area about one-fifth of the total area of the state—the remainder of the equipment is scattered in those sections where there are large watersheds, where there is possibility of floods, where soil conservation is being practiced on a large scale, and where other factors of that character enter into studies of meteorological conditions.

5 JAHN TRAILERS USED BY LOCK JOINT PIPE CO. on Water Supply Project

● Lock Joint Pipe Co., transporting 5,300 concrete pipe sections weighing up to 50 tons, to locations. 5 JAHN Heavy Duty 50-ton capacity semi-trailers were used to do the job. You'll find the same story everywhere—when you want to be *sure*, depend on JAHN TRAILERS.

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Highway construction involves more dirt moving than any other branch of engineering construction. ROADS AND STREETS, the only national engineering construction magazine devoted exclusively to, and covering all sections of, the highway field is the most effective and economical medium through which to sell dirt excavating, grading and hauling equipment.

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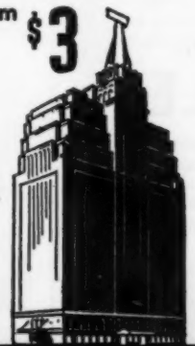

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Union Road Joint and Dowel Assembly. ONE-PIECE. Patented
Dowels Accurately Positioned and Locked Parallel.

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NEW EQUIPMENT and MATERIALS

New Unitilt Bulldozer

The Buckeye Traction Ditcher Co., Findlay, O., has developed new Buckeye Unitilt cable controlled bulldozers and trail-builders for all makes and models of tractors. The name of the new design is derived from the patented tilting device and the universality of the frame, which permits using either Buckeye bulldozer or trailbuilder moldboards on the same frame. One man can change moldboards, which can be dismounted from the tractor by pulling two kingpins. The sidearms and other parts stay in place. The tilting device is located on one sidearm and permits raising or lowering bulldozer or trailbuilder blade at either end a distance of 12 in. Turning one bolt only is all that is required to effect the tilting adjustment. Other features of the new design include: construction of the front cross beam so that the blades hug the radiator, thus reducing the heavy overhanging load on the front of the tractor and reducing wear on front idlers and track rolls; blade curvature which rolls the dirt ahead, reducing "dead" weight and permitting bigger loads in front of the blade; 60-in. lift of blade and unlimited depth of cut below ground level; natural digging action of blade which cuts as deep as operator desires without requiring any mechanical means of creating down pressure; balanced design which prevents tipping of tractor and keeps full length of crawlers on the ground; sidearms mounted at drive axle of tractor; rigid, fully braced members to withstand all types of 'dozing work. Literature and specifications on the Buckeye Unitilt equipment will be available on request from the manufacturer.

New Unitilt Bulldozer

For BETTER ROADS

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BITUVIA ROAD TAR

Because of construction and maintenance economies and because of its traffic safety BITUVIA road tar construction offers distinctive advantages to the contractor and to the public. Deep penetration holds the aggregate firmly for long service. BITUVIA is easily applied. It is highly resilient and skid-resistant. Made in seven types to meet any Federal, State, County or Municipal specifications.

PLASTUVIA CRACK FILLER

The unusual ability of this filler to withstand a wide range of temperatures —from bitter cold to torrid heat—without flow or traffic "pull" in summer, or chipping in winter, makes it an outstanding product. The ease with which it is applied, and the manner in which it holds tenaciously to concrete and brick surfaces characterize this material. Your inquiry will bring you further information about these products.

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FIFTEEN · PLANTS · TO · SERVE · YOU

New Wheel Tractors

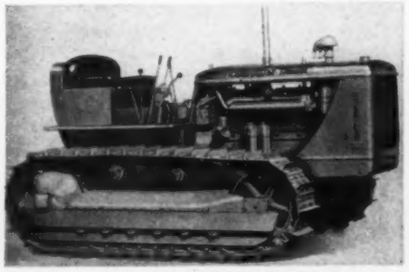
Five new wheel tractors have been added to the line of the International Harvester Co., 180 North Michigan Ave., Chicago, Ill. These tractors are designated as the "I" line and include three models with carburetor-type engines and two with International's full-diesel engines. All the five new tractors have Tocco-hardened crankshafts, pressure lubrication, replaceable cylinders, five forward speeds up to 15 miles per hour (except the I-6 and ID-6 which have five speeds up to 14 miles per hour), gear drive, countershaft brakes that can be individually controlled or interlocked, provision for mounting a variety of allied equipment, and various other features. The three tractors with the carburetor-type engines are respectively designated as Models I-4, I-6, and 119. The engines are of the 4-cylinder, valve-in-head type. The engine of the I-4 develops 29.5 H.P. at rated governed speed of 1,650 r.p.m.; that of the I-6, 40.5 H.P. at rated governed speed of 1,450 r.p.m.; and that of the I-9, 54 H.P. at rated governed speed of 1,500 r.p.m. The two new diesel-

New Model I-4 Diesel Wheel Tractor

powered tractors are respectively designated as the ID-6 and ID-9 and in dimensions and other characteristics, excepting engines, are similar to the I-6 and I-9. The engine of the Diesel ID-6 develops 38.5 H.P. at rated governed speed of 1,450 r.p.m., and that of the Diesel ID-9 develops 51.5 H.P. at rated governed speed of 1,500 r.p.m.

New Tractor

A new 55-H.P. diesel tractor has been announced by Caterpillar Tractor Co., Peoria, Ill. In this new D6 tractor, in addition to mechanical improvements, the efficiency of the machine has been increased by considering the operator's comfort, and by lessening fatigue. The tractor has been "geared to the job" with nine practical working speeds. Five of these are forward, offering a range of from 1.4 to 5.8 miles an hour, with the standard transmission group. For each of these first four forward speeds therere is a corresponding, but slightly higher reverse; and the motion of the tractor can be reversed by merely pushing or pulling a single lever. An optional transmission group, giving speeds spaced from 1.7 to 5.3 miles an hour, is available.



New "Caterpillar" 58-H.P. Tractor

In order to obtain greater strength and at the same time to keep weight within the correct limits, welded steel construction is used extensively. The frame and steering clutch case are of this construction, and are built into a one-piece unit. The new tractor is powered by a 6-cylinder, water-cooled "Caterpillar" diesel engine, with a bore and stroke of 4¼ in. x 5½ in., and a full load governed r.p.m. of 1,400. The engine is completely sealed against dust or dirt, and has only two working adjustments —the fan belt and valve clearance. Fuel and lubricating oil are filtered through special absorbent type cotton filter elements.

Engineers Pattern Chrome Clad Steel Tapes

A full line of engineer's pattern chrome clad steel tapes, ¼ in. wide, is now being offered by the Lufkin Rule Co. Chrome clad is an accurate steel tape, chrome plated. The markings are not only easy to read, but extra durable, a feature of equal importance. They are jet black on a satin chrome-white surface, free of glare. The chrome plating makes these lines rust resisting and gives them a surface that is hard, smooth and easily kept clean. Engineers chrome clad tapes are offered in two weights, the sturdy, medium and the extra heavy, both available marked feet, 10ths and 100ths feet, and feet, inches and 8ths. Cases, reels and frames are of improved patterns "Ranger" is the medium weight chrome clad line in leather case. Offered with both the medium and the extra heavy line is the ever popular "Wolverine" reel. The medium weight line in 4-arm metal reel with lock handle is the "Peerless," the heavy tape in similar assembly is the "Western" chrome clad. Still another of the family is Tape C-1576, the heavy duty fully subdivided line on metal reel of chain tape pattern.

New Tractor Highway Mower

A new highway mower brought out by the International Harvester Co., 180 North Michigan Ave., Chicago, Ill., is a combination of the International "A" tractor and side-mounted mower. It cuts a 5-ft. swath at mowing speeds up to 6 miles an hour and at any angle from 90 degrees above horizontal to 45 degrees below horizontal. A pneumatic power lift controls the angle of the cutter bar. The inner shoe can be raised and held at any level from the ground up to 12 in. above the bottom of the rear tire. This feature is especially desirable for cutting above a curb. Any angle of cut, listed above, is possible from any point at which the shoe is held. A hand lift raises and lowers the inner shoe of the mower. The cutter bar can be rotated or tilted 5 degrees up or 10 degrees down from horizontal. The mower is mounted ahead of the right rear tractor wheel. It is driven by a

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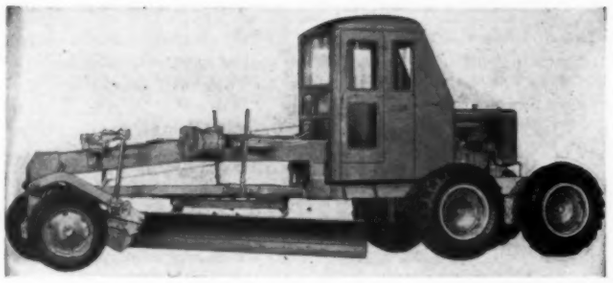
PARIS MANUFACTURING CO., INC.
PARIS, ILLINOIS

V-belt from the rear power take-off, then through a universal torque tube drive and bevel gears. The hardened, cut gears are enclosed and run in a bath of oil. A breakaway is provided for the bar if a solid obstruction is encountered—but the cutter bar does not strike the rear tire on the breakaway. The cutter bar is again hooked up by merely backing the tractor—the operator need not leave the seat.

New Motor Graders

A new line of hydraulically power controlled motor graders has been brought out by the W. A. Riddell Corporation of Bucyrus, O. These machines are the popular, single member frame, engine-over-transmission type, and embody the latest



New Riddell Motor Graders

type hydraulic power control system. The modern features of reversible blade, high lift bank sloping position, and power controlled leaning front wheels are also incorporated in this design. They are available with either hydraulic or manual steering mechanism. Built in several sizes, they are offered with gasoline power units ranging from 31.5 to 65, and diesel power units from 39 to 66.5 H. P. A deluxe, all-steel fully enclosed truck type cab fitted with safety glass is available for these machines, as well as 11 and 13 tooth scarifiers. New Bulletin No. 4100, descriptive of these machines will be mailed by the manufacturer on request.

SPRING RAINS

FINE FOR FLOWERS

BAD FOR ROAD JOBS

Protect with SISALKRAFT

When rain clouds blow, cover up with tough, waterproof SISALKRAFT road blankets. They're easy to handle — go on fast — protect completely. After the rain, work goes on from where it stopped — no time lost reworking soil — no costly drying and reblading of aggregate. Keep SISALKRAFT blankets and rolls ready for quick emergency use. Use them to protect cement, tools, machinery. They're weather insurance on any road job — and the recognized standard for low-cost "automatic" concrete curing. Ask your distributor or write for sizes, prices, full details.

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New Tractor Shovel Has 2½ Yd. Bucket

A new model has been added to the line of Traxcavators of the Trackson Co. This new machine, known as the Model T 7, is available with 2 or 2½ cu. yd bucket and

Model T 7 Traxcavator

is mounted on the "Caterpillar" D 7 tractor. The full 23,000 lb. push of the tractor can be applied to the bucket to penetrate and dig. The new machine is stated to travel around the job at speeds up to six miles per hour and to turn in its own tracks. The tractor is equipped with extended track frames and specially fitted to give the T 7 stability and traction to handle a 2½ yd. bucket. Quickly mounted bulldozer blade and other special attachments are available to increase the usefulness of this machine.

New Type Rubber Joint Sealer

A new rubber compound of the hot poured type is being used for the joints of the 165,000 sq. yd. of concrete runways in the Toledo, Ohio, Airport being completed this spring. More than 33,000 lb. of the quick-hardening substance, known as Rai-Seal, will be required for the job. Specifications for the airport called for a joint sealer which would have three essential characteristics: adhesion to concrete surfaces, resiliency at low temperature while being extended, and non-flowing properties at continued summer temperatures while under compression. The new compound has been tested in actual use for four years on heavily-travelled highway routes. It is stated that not only were the joints

still sealed at the end of that time, but indications were that the material's efficiency would extend over a much longer period. The method of installing Rai-Seal is essentially the same as that for bituminous materials. It is melted at 400 to 450 deg. F. in a regular heating kettle, poured into the joint, and may be exposed to traffic in from 10 to 20 minutes. The new product is manufactured by Rubber Associates, Inc., and is made in concrete color to blend with new concrete pavements and structures, and in black for resealing.

WITH THE MANUFACTURERS

Marion Appoints Joe Reed For West Coast

The Marion Steam Shovel Co., Marion, O., announces the appointment of Joseph O. Reed as district manager in the Pacific northwest. This includes the states of Washington, Oregon, Idaho and Montana. Mr. Reed brings to his territory a vast experience in the solving of material handling problems. This experience covers a period of more than 17 years, the entire time being devoted to contacting contractors, open pit mine operators, quarry operators, and the lumber industry in the same district he is now serving for Marion. The Marion line includes shovels, draglines, clamshells, cranes, pull-shovels and walkers in sizes ranging from ¾ cu. yd. to 35 cu. yds. capacities. Mr. Reed is maintaining temporary headquarters at the Parklawn Apartments, 2504 N.E. Hoyt St., Portland, Ore.

Ransome Appoints New Representative In Arkansas

The Ransome Concrete Machinery Company, Dunellen, N. J., announces the appointment of Kern-Limmerick, Inc., 115 North Spring Street, Little Rock, Arkansas, as a new agent. They will handle the sale of Ransome mixers (56-S and larger), pavers, truck mixers and agitators, bituminous mixers, hoist buckets, tower bins, sheaves, steel towers, mast plants, spouting, bin gates, carts, bar cutter and benders, truck mixer job hoppers, grout mixers, in the state of Arkansas.

2,342 Attend "Annual Get-Together" of H. O. Penn Co.

Each year shows a large increase in the number of registrations at the "Annual Get-Together" of the H. O. Penn Machinery Co., Inc., 140th St. and East River, New York City. This year the sessions were held March 14 and 15 and there was a total of 2,342 registrations. To welcome the big gathering the entire force of the H. O. Penn Machinery Co., Inc., which also maintains sales and service offices at Mineola, Long Island and at Poughkeepsie, N. Y., were on hand. One end of the display floor was equipped for buffet service, at which dinner and luncheon were served, which everyone seemed to enjoy.

On Friday evening a special preview showing was made, chiefly to executives of contracting companies and municipal officials. An improvised theatre seating 350 was set up in the company's service shop and was kept continually full during the Friday evening session and all day Saturday, where pictures of keen interest to construction men showed Bucyrus-Erie power shovels, backhoes and draglines tackling mountain-moving jobs; also "Caterpillar" tractors as power units for LeTourneau and LaPlant-Choate earthmoving equipment at work building and maintaining roads.

The exhibits included a complete demonstration truck, showing the vital working parts of the Caterpillar tractor, cut away for a full inside view while in operation.

The newest piece of large equipment was the T-7 Trackson Traxcavator, which is a 2½ cu. yd. capacity bucket-loader mounted on a "Caterpillar" diesel tractor. Nearby were shown the diesel electric generating sets and marine engines, the work of which was well shown in the "Caterpillar" movies.

Concrete mixers, from the light-weight trailer type to the big 5 cu. yd. Smith truck mixer were on display, as were the new Heltzel steel forms for concrete road making. Other road building equipment included motor graders, rooters, compressors, sand spreaders and pavers.

The Huber line of rollers for road work were on display and for the necessary car-

HAUL BIGGER LOADS

GET MORE TRACTION

SAVE ON EVERY TON-MILE

For real pulling power TWO driving axles under the load are far better than one.

With the THORNTON four-rear-wheel DRIVE, in addition to increased capacity and traction you get more flexible operation since you have two transmission ratios—one for power and one for speed. Your investment in equipment is 25 to 40% less, your operating and upkeep costs are from 30 to 50% lower. With THORNTON "Walking-Beam" spring design less shock reaches vehicle and load.

We can show you how to save with a truck equipped with THORNTON four-rear-wheel DRIVE. Users in scores of industries are lowering costs.

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penter work on forms, etc., the H. O. Penn Machinery Co., Inc., handles the Beach line of all-steel Saw rigs, three of which were shown.

Of interest to drillers and diggers were the full line of Barco gasoline hammers and the Thor line of rock drilling and breaking pneumatic tools. The Thor line is a new addition to the road construction equipment handled by the H. O. Penn organization.

A line of self-priming centrifugal pumps made by Marlow Pumps, Ridgewood, N. J., were displayed in sizes from 2 in. to 6 in., and for keeping excavations clear there was also shown a 4 in. diaphragm lift and force pump.

The John Deere Co., makers of plows and farm machinery, also had a number of pieces of equipment on the show floor.

Williamson Appointed Sales Manager Buda Jack Division

Roy P. Williamson has been named sales manager of the Jack Division of The Buda Co. of Harvey, Ill. He was until recently associated with the Gustin-Bacon Manufacturing Co. of Chicago and St. Paul, and has been identified with the railroad supply business for many years. He is a member of many railroad group associations including the Western Railway Club of Chicago.

Cutler-Hammer, Inc. Moves Indianapolis Office

The increased demand for Cutler-Hammer control equipment has necessitated moving the company's Indianapolis, Ind., sales office to 241 N. Pennsylvania St., Room 316. Cutler-Hammer, Inc., with headquarters in Milwaukee, Wis., is a pioneer manufacturer of electric motor control and allied electrical equipment. With over 20 years of experience in the application of Cutler-Hammer control, G. E. Hunt, sales engineer in charge of the Indianapolis office is a well qualified authority on this subject.

Ackerman Named to New Post at Dodge

Appointment of J. R. Ackerman as director of merchandising and advertising, Dodge Division, Chrysler Corporation, has been announced by E. J. Poag, Assistant General Sales Manager. Mr. Ackerman has been associated with Dodge for several years, formerly as a field manager and, until his present appointment, as assistant director of truck merchandising at the factory in Detroit. Ackerman has been engaged in the automobile business almost continuously for a period of more than 20 years. He has had production experience and is familiar with virtually every phase of motor vehicle distribution. Starting with an engineering education, Mr. Ackerman spent considerable time in the manufacturing end of the business. Subsequently he devoted several years to automotive service work and then entered the sales field. His experience in this line includes retail and wholesale selling and supervision for both dealers and factory branches, as well as regional and factory sales management. Mr. Ackerman's broad field and factory sales activities have included both passenger cars and trucks. During the first World War, Ackerman served as chief engineering officer of the USS Savannah attached to the 8th Division Submarine Force, U. S. Atlantic Fleet, operating twelve twin diesel powered undersea boats.

J. R. Ackerman

T. H. Boyd Killed in Automobile Accident

Theodore H. Boyd of the Galion Iron Works & Mfg. Co., Galion, O., was killed March 1 in an automobile accident. The accident occurred on Mr. Boyd's 36th birthday. He was born at Orrville on March 1, 1905, and was a son of the late David Charles and Elizabeth Findley Boyd. On June 1, 1928, he was married to Miss Ilo Latham, of Bellefontaine, who survives with two daughters, Judith Jane, age 10, and Ilo Kay, age 7. Others remaining are two sisters, Mrs. G. E. Stinson and Mrs. Russell Stewart, and three brothers, John S. Boyd, C. F. Boyd, and Ralph E. Boyd, all of Galion. Mr. Boyd had made his home in Galion since infancy and was well and favorably known. He was a member of First Methodist church, Galion Lodge, No. 1191, B. P. O. Elks, Galion Moose Lodge, No. 303, and served as vice-president and director of the Galion Country club last year. He was an official in the sales department of the Galion Iron Works and Manufacturing Co., which was founded early in the century by his late father, D. C. Boyd. Mr. Boyd attended Galion public schools and was graduated from Culver Military Academy, Culver, Indiana. He also attended University School, Cleveland, and Ohio State University, Columbus. He was a member of Sigma Alpha Epsilon fraternity.

Harry Strube Now Link-Belt Eastern Division Chief Engineer

Harry L. Strube has been appointed chief engineer of the Link-Belt eastern division of the Link-Belt Co. with headquarters at the company's Philadelphia plant, to succeed F. F. (Ferd) Waechter, who has resigned after rounding out 43 years of service. Mr. Strube has been assistant chief engineer at Philadelphia, having begun his Link-Belt service in the engineering department of the company's Pershing Road Chicago plant in 1910. Subsequently he served as sales engineer, first at Chicago and then in Philadelphia. In 1924, he rose to the position of manager of vibrating screen sales, and in 1934, was made assistant chief

Harry Strube

SPRINGTIME FOR PATCHING

Reduce Annual Maintenance by Permanent Patching.

Why not repair your roads this spring by making permanent patches instead of "just filling the holes?"

COLPROVIA PAVING MIXTURES

Are plant mixed and are ready for either immediate use or stockpiling; designed to match textures of all existing pavements—open or dense—for perfect patches.

ON NEW CONSTRUCTION

Surface with Colprovia Paving Mixtures and Eliminate Spring Patching.

Non-Skid, Cold-Laid Pavements Made By

COLD AND HEATED PROCESSES

COLPROVIA ROADS, INC.

Executive Office
183 East Main Street
Rochester, N. Y.

COLPROVIA

Laboratory and Office
801 Second Avenue
New York, N. Y.

engineer. Mr. Waechter started his Link-Belt career in 1898 in the company's Philadelphia plant engineering department under James M. Dodge, Charles Piez and Frederic V. Hetzel. In 1910, Mr. Waechter took over engineering sales in the southern Atlantic Coast states; in 1915, assumed charge of coal tipple sales in eastern territory; and in 1920, returned to the Philadelphia plant engineering department in the capacity of assistant chief engineer, becoming chief engineer in 1922. In tendering his resignation with the intention of retiring to a life of leisure in Florida, Mr. Waechter remarked—"I will have been with Link-Belt Co. 43 years on the 14th day of March, 1941—43 very happy years with the best, most helpful, and loyal men that it is the good fortune of any man to be associated with and for any company to have."

Browning Crane & Shovel Co. Appoints Faunt Le Roy Maryland Distributor

The Browning Crane & Shovel Co., Cleveland, O., has appointed Harry W. Faunt Le Roy, Calvert Bldg., Baltimore, Md., to act as its exclusive distributor in the sale and service of its shovels and cranes in the state of Maryland and the southern part of Delaware.

Thew Shovel Announces Promotions

The Thew Shovel Co., Lorain, O., announces the following appointments within the direct sales organization, effective March 1, 1941:

Mr. D. G. Savage has been promoted from sales manager to general sales manager in complete charge of all sales operations of the company.

D. G. Savage

Mr. Savage is a member of the Thew-Lorain 20 Year Veterans' Club, having started with Thew in 1919. He served in the production and purchasing departments before entering the sales department in 1922. Mr. Savage also has served as district manager of the Detroit, New York, Dallas, and Atlanta offices. In 1936 he was transferred to the home offices at Lorain and was appointed sales manager.

The following appointments have been announced by Mr. Savage:

M. B. Garber

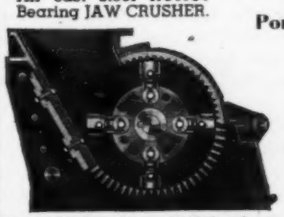
Mr. M. B. Garber is appointed assistant sales manager and also will retain his duties as export manager. Mr. Garber joined Thew in 1927 in charge of heavy construction, quarry, and sand and gravel sales. In 1929 he became sales office manager. In 1934, Mr. Garber also assumed the added duties of export manager and sales promotion manager. Mr. Garber is a past chairman of The Manufacturers' Division of both The

"COST REPAID IN 9 DAYS
— and better Stabilization!"
That statement is typical of letters received from highway engineers and contractors who have found the SEAMAN PULVI-MIXER a perfect answer to fast, thorough in-place mixing of road stabilizing materials.
Even when a travel plant is used in mixing, the PULVI-MIXER can profitably be employed to aerate or dry the materials beforehand to speed up the mixing operation.
Applications are numerous. In cut back asphalt, black top, oil mat, sand clay, asphalt emulsion (to name but a few) the tractor driven or the Motorized PULVI-MIXER does the job better and at far less cost.
Motorized Unit; 90 H. P. Motor
Top — Oklahoma City. Sand Tar Runway.
Center — Camp Lee, Petersburg, Va. Dry Mix Sand, Gravel, Clay.
Bottom—Camp Lee. Note Leveling Effected While Mixing.
SEAMAN MOTORS
MILWAUKEE WISCONSIN
APPROVED BY EXPERIENCE
The SEAMAN PULVI-MIXER
Delaware — Sand-tar Stabilization.

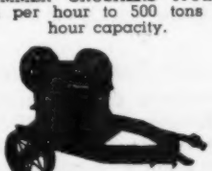
Serving America in Road Construction

All cast steel Roller Bearing JAW CRUSHER.

(Plant Pictured on the Job, State of Washington)
Portable Straight Line Crushing & Screening Plant



Cross Section View of Pulverizer
HAMMER CRUSHERS from 1 ton per hour to 500 tons per hour capacity.



Trailer Type Maintenance JAW CRUSHER with Universal Drive.

Where the Going is Tough
It's a Job for
GRUENDLER Portable Crushing Plants

On mountainous road work GRUENDLER equipment is better fitted to produce crushed rock in sizes to meet exact specifications. All parts exposed to wear are constructed oversize to meet the most trying conditions — the Portables are moved to and from slopes and cut ins with ease and without danger of tipping.

"No Better Equipment Manufactured"

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CRUSHERS • PULVERIZERS • EQUIPMENT

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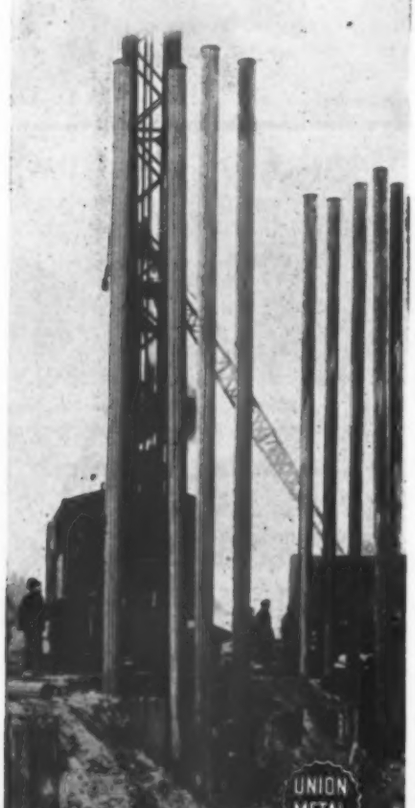
GRUENDLER CRUSHER & PULVERIZER CO.
2915-21 N. Market St., St. Louis, Mo.

"56 Years Building Better Crushers"

MONOTUBES
will go to
ANY LENGTH
to Solve a Foundation Problem

● This industrial plant addition called for 216 piles from 72 to 80 ft. in length. Five piles were to be used in each of the principal footings, which were designed to carry a load from 250 to 260 tons. The 7 ga. Monotubes selected were driven in two sections. The contractor first drove the lower 40 ft. in a footing, then attached the second section by means of a field splice and drove to final penetration. All Monotubes were driven with crawler cranes equipped with standard leads and hammer. The perfect alignment and plumbness of the partially driven Monotubes illustrated, testifies to the quality of their work.

Monotubes combine strength, safety and savings with speed of installation. They are light weight for easy handling; require no mandrel; can be driven speedily with standard equipment; and may be inspected thoroughly before concreting. For complete information on this modern method of pile construction, write for copy of Catalog No. 68A.



THE UNION METAL
MANUFACTURING CO.
CANTON, OHIO

Crushed Stone Association and the National Sand and Gravel Association.

J. L. Beltz

Mr. J. L. Beltz is appointed manager sales promotion and will have charge of all sales promotion activities. For the present, Mr. Beltz will retain supervision of advertising and publicity operations. Mr. Beltz first became affiliated with the Thew organization in 1924 when he joined The Universal Crane Co., Cleveland, O., Thew subsidiary. In 1927, he became advertising manager of Universal and in 1929, when Thew and Universal activities were consolidated at Lorain, O., he became advertising manager of Thew, a position held until this appointment. He is a past president of The Industrial Marketers of Cleveland, a director of the National Industrial Advertisers Association, a member of the Road Show Publicity Committee of A.R.B.A., and member of the Public Relations Division of the American Road Builders Association.

Mr. R. T. Cobb, who has been Mr. Garber's assistant, becomes sales office manager. Mr. Cobb joined Thew in 1929 in the service department and transferred to sales in 1935.

Mr. J. W. Shields continues as Canadian sales manager and will have supervision over an expanded territory covering the entire Dominion of Canada, except British Columbia. Mr. Shields is also appointed as district sales manager of the Buffalo, N. Y., territory. Mr. Shields became a member of the Thew organization in 1926, and was instrumental in developing the sales field for the newly developed backdigger. In 1929, Mr. Shields became manager of the resale department, a position held until this promotion.

Mr. H. H. Buchanan of San Francisco, is promoted from district sales manager to western manager of sales in charge of Thew activities in the eleven Western States and British Columbia. Mr. Buchanan joined Thew in January, 1939. Before that he served as district manager for Bucyrus-Erie Co., and later in the sales promotion and training division of Caterpillar Tractor Co.

Mr. J. T. Connors has been appointed assistant manager used equipment sales, a position he will hold in conjunction with his activities as district sales manager for Chicago and Minneapolis territories. Mr. Connors first joined Thew in 1925, through the Universal Crane Co., Thew subsidiary.

Expansion Joint Company Formed

Recent newcomer to the expansion joint field is the Keystone Asphalt Products Co., a division of the American-Marietta Co., one of the country's largest manufacturers of asphalt paint. According to Grover M. Hermann, who heads both companies, the Keystone Division will operate nationally, producing a complete line of asphalt expansion joints, as well as many resilient types such as fiber, cork, etc. In addition to joints, they will manufacture sewer compounds, sub-grade felts, asphalt planking, waterproofing and rigid sheathing boards, and other asphalt products for the highway industry. T. R. Johnson, who has long been identified with the paving industry and for the past ten years has specialized in the expansion joint field, has been appointed sales manager of the new division. He was formerly connected with the Servicised Products Corporation, Chicago. Keystone sales offices are at 43 East Ohio St., Chicago, while the factory is located in Chicago Heights, a suburb of Chicago.

Lee Appointed Sales Engineer Dodge Truck Division

Appointment of D. W. Lee to the position of sales engineer has been announced by L. D. Cosart, Sales Manager, Truck Division, Dodge Brothers Corporation. In his new capacity Mr. Lee, who has been in charge of Dodge diesel truck sales promotion for the past three years, will continue this work and, in addition, will coordinate product development for the entire line of Dodge Job-Rated trucks, both gas and Diesel powered. Before joining the Dodge truck factory sales department in November, 1937, Mr. Lee was for several years connected with the Chrysler Corporation engineering division. He is a Massachusetts Institute of Technology graduate. T. A. Demetry, formerly associated with the Dodge service department, has been named as an assistant to Mr. Lee.

Spencer of Standard of New Jersey Elected Asphalt Institute Head

At their annual meeting the board of directors of The Asphalt Institute elected as their first full-time president, Herbert Spencer of the Standard Oil Co. of New Jersey, for the fiscal year beginning April 1, 1941. Vice Presidents elected were J. A. Blood of Standard Oil Co. of California, J. F. Lucey of Talco Asphalt & Refining Co., and H. B. Pullar of Berry Asphalt Co. A. M. Maxwell of Standard Oil Co. of Ohio was elected chairman of the Executive Committee with Messrs. Blood, Lucey, Spencer and Waxman as members; David Waxman of Shell Oil Co., Inc., treasurer, and George R. Christie, Socony-Vacuum Oil Co. Inc., secretary. W. R. Macatee, who had been serving as assistant and also acting managing director, was elected managing director with office at 801 Second Ave., New York, N. Y., continuing also in direct charge of the Washington, D. C. office of the Institute.

New Executive Announced by Laminated Shim

New appointments of executives have been announced by Laminated Shim Co., Inc., Glenbrook, Conn., following the recent meeting of its board of directors. E. B. Nisbet, formerly purchasing agent and treasurer, becomes executive vice-president of the company. E. R. Young, the former factory manager, steps into an enlarged portfolio as the new vice-president in charge of production. Richard Seipt, as the newly-appointed vice-president in charge of

HERCULES

Ironeroller

Does the work of two—why use two when one will do.

Write for new catalog

6 to 12 Ton

Gas or Diesel

THE HERCULES COMPANY MARION - OHIO

A BURCH ON THE JOB

A BURCH FORCE FEED SPREADER on the job will insure an even, uniform stone mat. Specially designed cylinder will eliminate corrugating, dual feed gate control gives a wide range of adjustment to the flow of material. The machine is operated by the movement of the truck forward or backward.

Manufactured by

THE BURCH CORPORATION

Crestline, Ohio

Builders of equipment for Fifty Years

sales, takes on responsibilities in addition to those held during his term as sales manager. All appointments become effective immediately.

Groce Appointed General Service Manager of Buda

Appointment of G. D. Groce, formerly of Cleveland, O., as general service manager of the Buda Co. at Harvey, Ill. (Chicago suburb), has been announced by R. K. Mangan, Executive Vice-President. Mr. Groce has been connected with the automotive industry in a manufacturing and engineering capacity for many years and during the past ten years, was service manager of the Cleveland Tractor Co. He has traveled extensively in the United States and abroad. He and his family will reside at Olympia Fields.

Walter T. Norris Appointed District Engineer for American Institute of Steel Construction

The American Institute of Steel Construction has appointed Walter T. Norris of Oakland, Calif., as district engineer for the Pacific Coast, with headquarters at San Francisco. Mr. Norris is a graduate of the University of Detroit. He has been sales and designing engineer for The Moore Dry Dock Co. of Oakland, and was engaged in steel construction work in Birmingham. Ala., before going to the Pacific Coast in 1938. The other district engineers are located at Worcester, Mass.; New Orleans, La.; Atlanta, Ga.; St. Louis, Mo.; Philadelphia, Penn.; Cleveland, O.; Chicago, Ill., and Topeka, Kans.

Andrew Hutton Appointed Works Manager of Robins Conveying Belt Co.

Thomas Matchett, President of the Robins Conveying Belt Co., has announced the appointment of Andrew Hutton as works manager of the company's Passaic, N. J., plant. Mr. Hutton is in charge of all manufacturing operations, buildings and equipment. Mr. Hutton is a member of the Institution of Naval Architects of London, England. a Whitworth exhibitioner with Bronze Medal in Technology and a senior member of the Society of Industrial Engineers of America. Mr. Hutton was recently chief engineer of the Davis Engineering Corporation, Elizabeth, N. J., and was previously vice-president and general manager of the Taylor Manufacturing Corporation, Milwaukee, Wis.

Charleston Tractor and Equipment Corp. in New Quarters

The Charleston Tractor and Equipment Corp., distributors of contractors equipment, is now located in its new headquarters on Kanawha Blvd., Charleston, W. Va. The new building is 120 ft. by 240 ft. on the ground floor. The front portion, 50 ft. by 120 ft., is the show room. The rear portion, 120 ft. by 154 ft.,for service, parts and storage purposes. The office, located on the second floor, is 50 ft. by 80 ft.. of which the sales room takes up 20 ft. by 40 ft. The remainder of the office space is taken up by the literature room, general

Why you need a SMITH COMPRESSOR

PORTABILITY

Think of the many advantages of such a lightweight, portable compressor! Move it easily from one job to another. Tow it at permissible truck speeds.

DEPENDABILITY

Made with FORD MOTORS and standard parts. Its ruggedness and efficiency are sources of constant satisfaction to users everywhere. Repairs and parts available at any Ford garage.

ECONOMY

Priced far below standard compressors of equal capacity. 60 cu. ft. size uses only 1 gal. of gasoline an hour!

Two sizes: 60 cu. ft. and 120 cu. ft. capacity. Head equipped with high speed compressor valves; automatic unloading and idling.

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free booklet

GORDON SMITH & CO.

475 College St. Bowling Green, Ky.

★ Smith ★ AIR COMPRESSORS

WELDED

ROLLED STEEL CONSTRUCTION for GREATER STRENGTH and SPEED

. . . writes a veteran crane operator who has been swinging buckets for 10 years. There's a reason! Williams sheave assembly, with sheaves set askew (see illustration), keeps leads straight, reducing friction and fraying. Cable lasts longer. Sheave block is protected against contact with bucket load; open ends guard against clogging and abrasive wear.

Williams special Welded Rolled Steel Construction also increases strength and improves balance of bucket. A Williams insures faster work, cleaner dumping, more yardage, and operates for years practically free of costs for maintenance and repairs.

Prompt delivery and service through nation-wide distributors. Write for Free Bulletins on any of the 11 types of Williams Buckets.

THE WELLMAN ENGINEERING CO.
7003 Central Avenue Cleveland, Ohio

WILLIAMS *Buckets* built by WELLMAN

New Building of Charleston Tractor and Equipment Corporation

office and side private office. The personnel of the company includes Lon M. Rish, president; H. D. Anderson, general manager; E. M. Corrigan, credit manager; W. S. Poorman, sales promotion; M. R. Hamill, advertising and sales; C. A. Nash, manager of parts and service; Dewey Mullins, service manager; John Mullen, parts manager. The company, with H. D. Anderson as general manager, started operations in Charleston in 1935 with a force of only six. Mr. Anderson now has a staff of 40.

T. R. Johnson Named Sales Manager of Keystone Products

T. R. Johnson

The appointment of T. R. Johnson as sales manager of the newly formed Keystone Asphalt Products Co. has been announced by Grover M. Hermann, President of that company. Mr. Johnson has long been identified with the paving industry, and for the past ten years has specialized in the expansion joint field. He was formerly connected with the Servicised Products Corporation, Chicago. The Keystone Asphalt Products Co., located at 43 East Ohio St., Chicago, Ill., will manufacture at their Chicago Heights plant a complete line of asphalt, fiber, and cork expansion joints, as well as other paving specialties including sewer compounds, sub-grade felts, asphalt planking, waterproofing and sheathing board, along with several other types of asphalt products for the highway industry.

Buda Opens New Sales Office at Washington, D. C.

The Buda Co., Harvey, Ill., has opened an office and display floor at 1469 Church St., Washington D. C. The office will be under the direction of Col. H. H. Frost, Vice-President, with G. C. Humphreys, Manager of Engineering, and E. C. Asher, Office Manager.

C. W. Hiner Appointed Acting District Engineer for PCA

The appointment of C. W. Hiner as acting district engineer in Nebraska for the Portland Cement Association has been announced by Wm. M. Kinney, general manager. From headquarters in Lincoln, Hiner will have three field engineers working with him to assist concrete users throughout Nebraska with design and construction problems. Hiner's appointment, following the resignation of H. J. Young, climaxes 13 years of service as a field engineer with the Association in Lincoln.

Book for Keeping Truck Costs.—A useful book for keeping complete and accurate records of truck operating costs has been published by the Dodge Division, Chrysler Corporation. The book, called "Operating Record for Motor Trucks and Passenger Busses," contains ruled page forms for each month of the year. On these pages the truck operator can set down daily expenditures for gasoline, oil, repair and maintenance items, drivers' and helpers' wages, speedometer readings, daily mileage, hours of operation, number of stops, number of trips, and the average load. At the end of the month the operator has a concise and easily analyzed record of his truck operating costs. Pages for indirect costs make it easier for the average truck owner to compute the cost of taxes, license, garage, administrative expense or overhead and insurance. Forms are also provided for a summary of the total expenses for the year. Distributed free of charge, the book can be obtained by addressing a request to the Advertising Department, Dodge Division, Chrysler Corporation, Detroit, Mich.

New Publications on Asphalt.—Publications issued by the Asphalt Institute during the past month in both its research and construction series include the following:

Research Series No. 6, "The Significance of Various Methods of Test Used on Asphaltic Paving Materials."

Research Series No. 7, "A Direct Method of Determining Thickness of Asphalt Pavement with Reference to Subgrade Support."

Construction Series No. 54, "The Wash-

SNOGO
For Complete Snow Removal
ELIMINATES dangerous one way bottlenecks. Reduces expensive repeat plowing. Reduces snow damage to roads, and cuts resulting road repair. Plan now for real snow removal next winter.
Klauer Manufacturing Co.
DUBUQUE
IOWA

CLEARING HOUSE

USED EQUIPMENT
IMMEDIATE DELIVERY

	Condition
1—9" x 16" bronze bearing DIAMOND jaw crusher complete with flywheels and Model P2877D2 LeRoi motor mounted on trailer unit with steel wheels	New
2—Pitman assemblies with S.K.F. bearings including main bearings for 10" x 20" jaw crusher	New
1—15" x 36" roller bearing DIAMOND jaw crusher	New
1—15" x 36" Pitman assembly—new design with 8" shaft, including main bearings	New
1—Bucket elevator 32'0" centers, rigid type, with buckets 12" x 6" x 7¾" mounted on belt	New
*5—Pitman assemblies for 10" x 20" jaw crusher, bearings S.K.F. type	Slightly Used
*1—Pitman assembly for 10" x 20" jaw crusher, bearings Timken type	Rebuilt
1—10" x 20" roller bearing DIAMOND jaw crusher equipped with Timken bearings	Rebuilt
*3—10" x 36" Pitman assemblies for 10" x 36" jaw crusher	Rebuilt
*1—15" x 36" Pitman assembly complete	Rebuilt
1—20'0" bucket elevator with buckets 10" x 6" x 7¾" mounted on chain	Rebuilt
1—30" x 10'0" double shaker screen	Slightly Used
1—Grizzly and hopper 6'8" x 6'8"—with 8" sq. openings and 20"x3'0" plate feeder.	Good Condition
2—Quarry plants with 10" x 20" anti-friction bearing jaw crushers and bucket elevators, mounted on trucks with four steel wheels	New
2—30 cubic yard bins, 3-compartment, no jack legs	New
1—No. 25 hog, anti-friction bearing type with cast steel discs	New
6—Steel wheels 40" dia. x 16" face to take 4" Hyatt bearings	New
4—Steel wheels 40" dia. x 10" face to take 4" Hyatt bearings	New
4—Steel wheels 28" dia. x 4" face, bore 1¾"	New
10—Steel wheels 28" dia. x 5" face, bore 1-15/16"	New
8—Steel wheels 24" dia. x 3½" face, bore 1⅝"	New
4—Steel wheels 28" dia. x 14" face, bore 4" Hyatt	New
1—Allis-Chalmers motor, 25 H.P.	Reconditioned
1—Allis-Chalmers motor, 60 H.P.	Reconditioned

*The above Pitman assemblies can be installed in new bases and furnished as complete machines.

DIAMOND IRON WORKS, INC. AND MAHR MANUFACTURING CO. DIV.
MINNEAPOLIS MINNESOTA

EQUIPMENT FOR SALE OR RENT

1—completely rebuilt 10 ton, three wheel AUSTIN Autocrat Roller, excellent condition.
1—CLETRAC rebuilt front end loader, crawler type.
1—315 LeRoi two stage compressor.
1—315 SCHRAMM two stage compressor.
1—210 SCHRAMM gas compressor.
1—210 SCHRAMM diesel compressor.
3—60 LeRoi compressors.
1—4" CARTER Centrifugal pump.
1—3" CARTER Centrifugal pump.
3—3" CARTER Single Diaphragm Pumps.
2—2" CARTER Centrifugal pumps.
1—AUSTIN 12 foot Motor Grader.
1—ADAMS 10 foot Motor Grader.

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ington National Airport and Choice of Surfacing Types for Airports."

Construction Series No. 55, "Specification for Asphalt Enamel Protective Coatings for Steel Water Pipe."

Construction Series No. 56, "Asphalt for Heavy-Duty Highways."

Pocket Reference Manual for Highway Engineers. A new edition, enlarged to 256 pages, to include the most recently developed data on asphalt uses.

Single copies of these publications are available to officials, engineers, technologists and the industry, without charge, upon request to ROADS AND STREETS.

Bituminous Mixer.—A new booklet on the Barber-Greene bituminous mixer has been issued by the Barber-Greene Co., Aurora, Ill. The booklet was published to show the three basic set-ups: Travel plant for low cost road mix, central plant for "intermediate" type mixes, central plant with gradation control for high type mixes. The correct applications, advantages, and limitations of each set-up are thoroughly discussed. In addition to its high value as a source of information, the booklet is unusually attractive, being entirely illustrated in natural color photography. Copies of the booklet, known as Bulletin 842, are available on request to all who write Barber-Greene Co., Aurora, Ill.

Hoists and Repair Towers.—Gar Wood Industries, Inc., Hoist and Body Division, Detroit, Mich., has issued two new bulletins on its products. Bulletin No. 2 illustrates and describes a complete line of Gar Wood cam and roller hoists for installation on all sizes of trucks, trailers and 6-wheelers. Bulletin No. 11 illustrates and describes Gar Wood hydraulic repair towers for installation on any truck chassis rated 1½ tons or more.

Mortar and Plaster Mixer.—A folder describing the new 1941 Rex mortar and plaster mixer has been issued by the Chain Belt Co., Milwaukee, Wis. This new Rex mixer has been entirely redesigned but still retains the basic mixing principle so successfully used for years in Rex mortar and plaster mixers. The folder contains all pertinent detailed specifications and dimensions.

Shovels, Draglines and Cranes.—The Osgood Co., Marion, O., has issued a new, fully illustrated catalog describing its Type 80, Model 800 air-control shovels, draglines, and cranes. The book sets forth in its 16 pages how the Model 800 is built, how air-control works. A copy will be furnished to anyone interested, upon request to your publication, or to The Osgood Co. at Marion, O. Merely ask for Catalog No. 4102.

CALL FOR BIDS

U. S. ENGINEER OFFICE, SECURITY MUTUAL BUILDING, BINGHAMTON, N. Y. Sealed bids, in duplicate, will be received here until 11 A. M., E.S.T., April 29, 1941, and then opened, for construction of Flood Protection Project (Section No. 1), Elmira, N. Y. Plans may be obtained by a deposit of $25.00 in the form of CERTIFIED check or money order payable to Disbursing Officer, U. S. Engineer Office, Binghamton, N. Y."

MANGANAL
TRADE MARK REG. U. S. PATENT OFFICE
CAST WEDGE BARS

FOR REPOINTING MANGANESE STEEL SHOVEL TEETH
STULZ-SICKLES CO.
NEWARK, NEW JERSEY
SOLD ONLY THROUGH DISTRIBUTORS

Reliance—
CRUSHING SCREENING and WASHING UNITS
● UP TO 2000 TONS A DAY ●

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Air Separa-
Wash Boxes	Kettles	tors
	Conveyors	

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Kingston, N. Y.
Canadian Representatives: F. H. Hopkins & Co., Ltd.
340 Canada Cement Co., Montreal, Que., Can.

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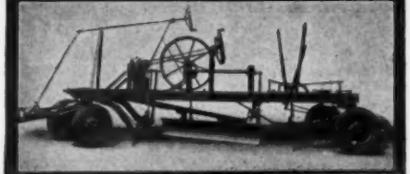


For Better Roads, put a WORKMAN Machine on the job. 3 sizes:
THE GENERAL • THE SUPER
THE MASTER
YORK MODERN CORPORATION
UNADILLA, NEW YORK

MORE POWER

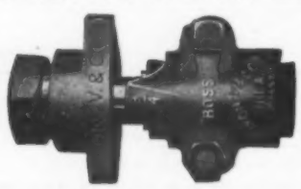
at the Drill, Hammer or Spade!

The couplings described below fit and grip the hose end *so tightly* that coupling leaks and pressure losses cannot occur.

"DIXON" AIR HAMMER COUPLING

"DIXON" Air Hammer Couplings meet every condition of service on hand hammer and rock drill operations with maximum economy and reliability. Simple construction, yet strong and durable to withstand incessant vibration and rough usage. Cadmium plated—rustproof. Coupling complete consists of male or female spud, stem, wing nut, clamp and washer.

Compact Type, Style WLD-7, ½" and ¾"
Heavy Type, Style WHD-9, ¾" and 1"



"BOSS" AIR HAMMER COUPLING

Same as above except furnished with sturdy malleable iron "BOSS" Clamp to insure the extra strength and gripping power required for the more severe types of service. Fingers of clamp engage collar on coupling stem, securely anchoring coupling to hose. Cadmium plated—rustproof.

Compact Type, Style WLB-21, ½" and ¾"
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